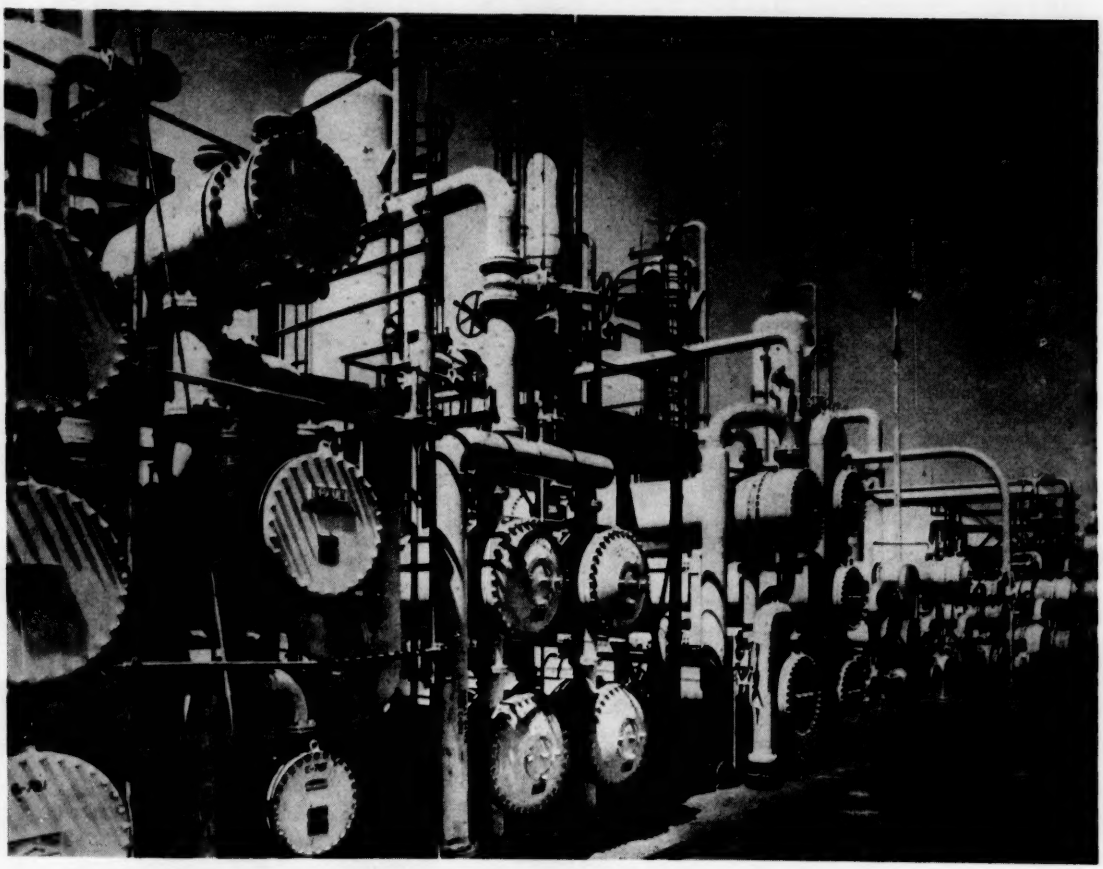
INDUSTRIAL REFRIGERATION

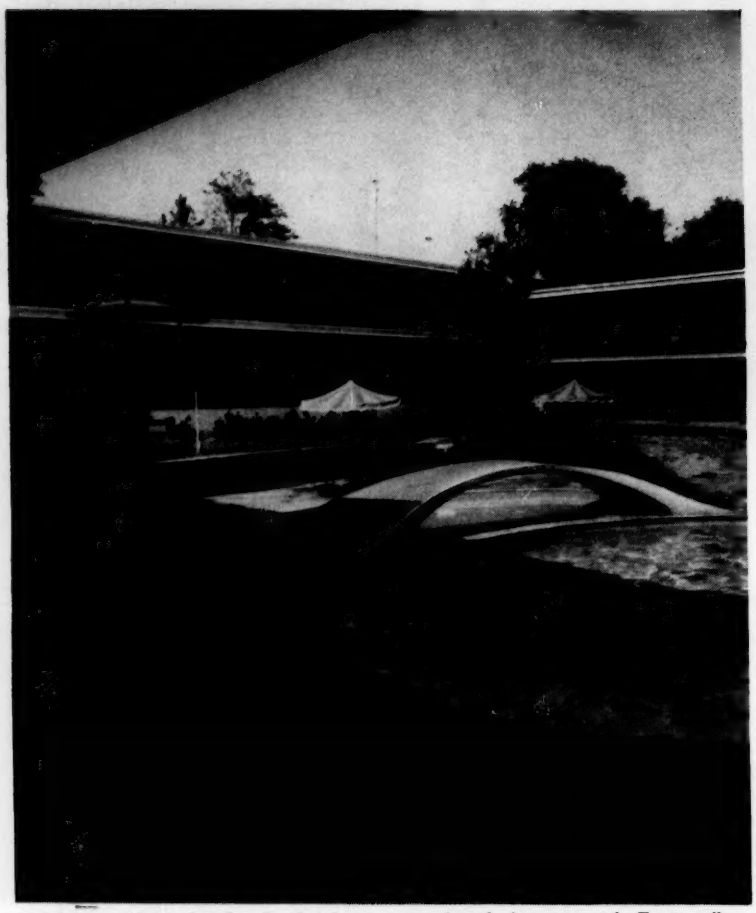
April, 1959

Vol. 136, No. 4

Longer Life, Lower Maintenance, Increased Efficiency Claimed For Newest Industrial Aluminum Heat Exchangers



In super-motels, "super 8's" and supermarkets...



Air-conditioned luxury is only a few feet from your car in today's super-motels. For travellers, air-conditioned super-motels like the one shown above are a home away from home—combining convenience, comfort, often such added attractions as air-conditioned lounges, playrooms and restaurants. Motels *without* air-conditioning just can't compete.

The men enjoy smoking cigars and, with air-conditioning in the car, the whole family enjoys the trip—with the windows up! Americans spent about $150,000,000 on automobile cooling equipment in 1958.

Shopping convenience and comfort—in one of the thousands of bright new air-conditioned supermarkets that make shopping so pleasant. Smart store operators know that air-conditioning increases sales volume.

You'll find

genetron®

SUPER-DRY REFRIGERANTS

Approved!
Accepted!
Preferred!

"Genetron" super-dry refrigerants are universally accepted for use as original or replacement charge in America's finest refrigeration and air-conditioning equipment. Leading manufacturers approve and endorse them. Refrigeration engineers specify them. Wholesalers recommend them. Servicemen and contractors know they can depend on them. That's because "Genetrons" offer unexcelled quality and dryness . . . and their strict specifications are consistently *bettered* in production.

"Genetrons" are available from wholesalers everywhere, coast to coast. See your wholesaler! Insist on "Genetron"!

genetron 11 ORANGE LABEL CCl_3F
TRICHLOROMONOFLUOROMETHANE

genetron 12 WHITE LABEL CCl_2F_2
DICHLORODIFLUOROMETHANE

genetron 22 GREEN LABEL $CHClF_2$
MONOCHLORODIFLUOROMETHANE

genetron 113 PURPLE LABEL $C_2Cl_3F_3$
TRICHLOROTRIFLUOROETHANE

genetron 114a BLUE LABEL $C_2Cl_2F_4$
DICHLOROTETRAFLUOROETHANE

Allied Chemical

GENERAL CHEMICAL DIVISION
40 Rector Street, New York 6, N.Y.

STOP

"Butcher Boy"

Since 1885

No. 51 AUTOMATIC ELECTRIC DOOR DEFROSTER

(WITH THERMOSTAT)

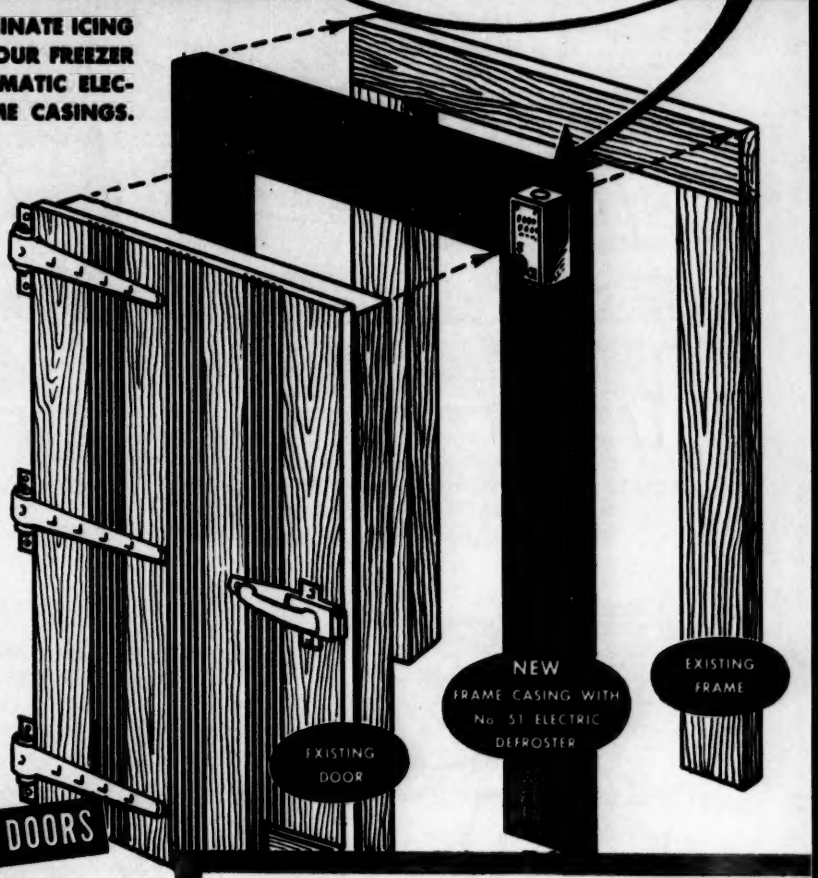
ELIMINATE ICING GASKET CONDITIONS ON YOUR FREEZER DOORS WITH BUTCHER BOY No. 51 AUTOMATIC ELECTRIC DEFROSTERS INSTALLED IN NEW FRAME CASINGS.

Easy to Install

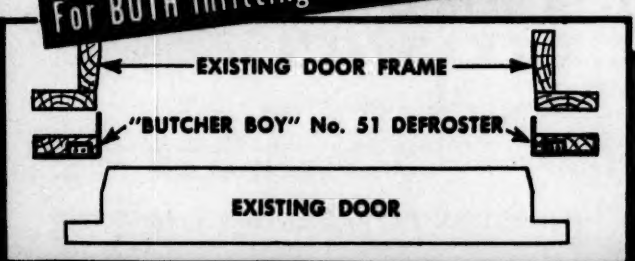
ON YOUR PRESENT DOORS

1. Remove the door and hardware from your present frame.
2. Install factory furnished frame casing with defrosters, to existing frame casing and secure in place with provided fastening devices.
3. Reinstall the door and hardware to new frame casing.
4. Connect to 110 Volt AC line and "Frost Free" door is ready for normal operation.
   Each complete unit is equipped with a "calibrated thermostat control", (adjustable range 60° to 250°F), for economical heat control. Thermostat has "pilot light" as constant guide for "on current" operation — Safety and Security Insurance.

Electrical materials incorporated into Butcher Boy No. 51 Defroster Units are Underwriters Appoved.



For BOTH Infitting and Overlap DOORS



Butcher Boy Refrigerator Door Co.
1000 Butcher Boy Drive, Harverd, Illinois

Please send details and prices for factory furnished frame casings with No. 51 automatic electric defrosters.

For Super Freezer Overlap Doors ☐ _____wide x _____high

For Infitting Freezer Doors ☐ _____wide x _____high

Name _____

Address _____

City _____ State _____

MARCH—Bought lower grade ammonia at bargain price on supplier's vague quality claims . . .

LATER—Moisture in ammonia . . . expansion and float valves frozen . . . flow hindered and then stopped . . .

STILL LATER—Oil film on evaporators and condensers . . . heat transfer reduced. Head pressure and power costs up . . .

TOO LATE—Plant slowdown. Efficiency off. Operating costs up . . . and profits down . . .

BE TROUBLE-FREE! Buy the trouble-free ammonia from Armour—purest money can buy!

ARMOUR AMMONIA DIVISION

1355 West 31st Street • Chicago 9, Illinois

Quality ammonia from the most distribution points . . . 171 cylinder stock points, 12 bulk stations!

April 1959

Number 4

Vol. 136

Industrial Refrigeration

Now in its 67th Year of Publication

H. T. McDermott
Editor and Publisher

J. R. Kelahan
Managing Editor

H. D. Busby
Associate Editor

ADVERTISING
O. Rhodius Elofson, *Director*
Edw. Davieson, *Representative*

Helen B. Smith
Secretary

E. P. Swanson
Subscription

V. S. Smith
Production

Official Organ
National Association Practical Refrigerating Engineers

INDUSTRIAL REFRIGERATION, Vol. 136, No. 4. Published monthly at 433 N. Waller Ave., Chicago, Ill., U.S.A., by Nickerson & Collins Co. Yearly subscription in the U.S., $2.00 per year; other countries, $3.00. Single copies, 25 cents. Copyright 1959 by Nickerson & Collins Co. Acceptance as controlled circulation publication at Chicago, Ill., and Pontiac, Ill.

CHANGE OF ADDRESS—Notify publisher and your local post office promptly of change of mailing address to avoid non-receipt of copies. Copies incorrectly addressed, because of failure to notify publisher, cannot be replaced. Upon request, post office will provide, without cost, convenient "change of address" mailing cards.

Industrial Refrigeration is indexed regularly by Engineering Index, Inc., and is microfilmed for library use by University Microfilms.

Contents

What's New Features Equipment To Hold TTT Specs 7
Time-Temperature-Tolerance specifications for the entire frozen food industry are being tightened up. Manufacturers have introduced improved lines to meet changes in the industry from the food freezing plant to the retailer. Added to the mechanical equipment changes is the rapidly expanding line by the foamed insulation industry. Most major chemical manufacturers are now producing raw ingredients and most insulation producers are now manufacturing various forms of polyethylene, polystyrene and polyurethane.

Liquid Freezing of Poultry 8
Three years of turkey production with a calcium chloride immersion freezer was reported on to the Institute of American Poultry Industries at Kansas City in February. Consumer acceptance proves the investment.

Refrigerated Warehouse Construction Continues 11
Alford, Jr., has broken ground for a million cubic foot warehouse in Corpus Christi, Texas. Other warehousing, both public and private continues expansion while industries producing products requiring refrigerated storage, continue their economic research.

Varied Refrigeration Utilized By Royal Castle 12
Quality beef preparation and fresh made buns for a hamburger empire, require varied refrigeration applications and temperatures. Royal Castle in Florida controls bakery processes with direct, chilled water, and air cooling uses of refrigeration. Beef is held and processed under refrigeration regulated temperatures. Employee comfort is not overlooked, and even the automatic book-keeper is kept cool. All systems employ air condensing.

Readying Centrifugals For The Air Conditioning Season 17
Rapid expansion of office and institutional building air conditioning has bled off the more experienced centrifugal plant engineer to position as chief. According to Frank L. Chase, NAPRE Educational Director, the youngster moving up has skyrocketed the number of service calls to manufacturers through lack of equipment operating knowledge. Author Paul Ellard and Chase hope to reduce a few of the unnecessary calls in 1959 with the instructions starting on page 17.

Departments

Press Briefs	4	Conventions	31
What's New	7	Question Box	32
Ice Sports	29	Ice Industry	34
Transportation	30	NAPRE	36

COVER: Modern Gas Treating Plant Reports Increased Efficiency With Aluminum Heat Exchangers.

▶ ALUMINUM use in heat exchangers is increasing rapidly, especially in the industrial applications of water, petroleum and natural gas, ammonia and ammonium compounds, food industries; as air pre-heaters, for refrigeration condensing and evaporative surface, and for gas coolers. Longer life and lower maintenance expense is claimed for these vessels, resulting it is said from aluminum's corrosion resistance.

Published Monthly by NICKERSON & COLLINS CO.
General Offices: 433 N. Waller Ave., Chicago 44, Ill. Teles.: AUstin 7-1303-04-05

news briefs of the month

French Cold Storage Firm Works In Gamma Radiation

Conservatome Co., a combine of 22 food and farm producers, will experiment in gamma radiation at Dagneux, France. This cold storage company, founded in 1956, will continue experiments begun at the Center of Nuclear Studies, Saclay, in 1954. Another Conservatome Co. will be formed in Italy with the same objectives.

Research by the French Center proves that radiation stimulates growth of plants up to a point. Beyond this point it sterilizes, preventing sprouting of onions and potatoes. Increased further it pasteurizes products and at several million units destroys enzymes, the substance which cause chemical changes in produce.

Dairy Production Index Issued Early This Year

Production figures for ice cream and related products in the U.S. and Canada for 1958 were published early in March by the International Association of Ice Cream Manufacturers in the PRODUCTION INDEX. Compiled by IAICM's Statistics and Information Department, this publication shows that California replaced Pennsylvania as the top producers of all frozen dairy products, although Pennylvania remains on top in production of ice cream alone. Distributed by IAICM as a membership service, non-members can obtain a copy for $2.00.

Seafood Warehouse At Philadelphia Center

Food Fair Stores, Inc., announced early in March that it will build a $300,000 seafood warehouse in the $100-Million Food Distribution Center, Philadelphia. According to the PHILADELPHIA INQUIRER RETAIL MEMO, the air conditioned and refrigerated warehouse will be the chief distribution point for seafood to Food Fair Stores from Connecticut to Maryland. The supermarket chain is the 4th major firm to announce plans in connection with the 388-acre center.

Perloff Brothers. Inc., a Philadelphia firm will relocate in the Food Distribution Center. They will build a $2,500,000 office and warehouse building. The company supplies $50-million worth of foodstuffs to 5,000 independent retail stores and 1,200 institutions in a 7-state area. Horn & Hardart Baking Co., will build a $6.5-million dollar commissary in the heart of the center's first-stage area which will house a bakery, ice cream plant and cooking facilities for all foods except fresh vegetables. Penn Fruit will build an installation for handling and processing all its perishable foods on a 10 acre site in the center.

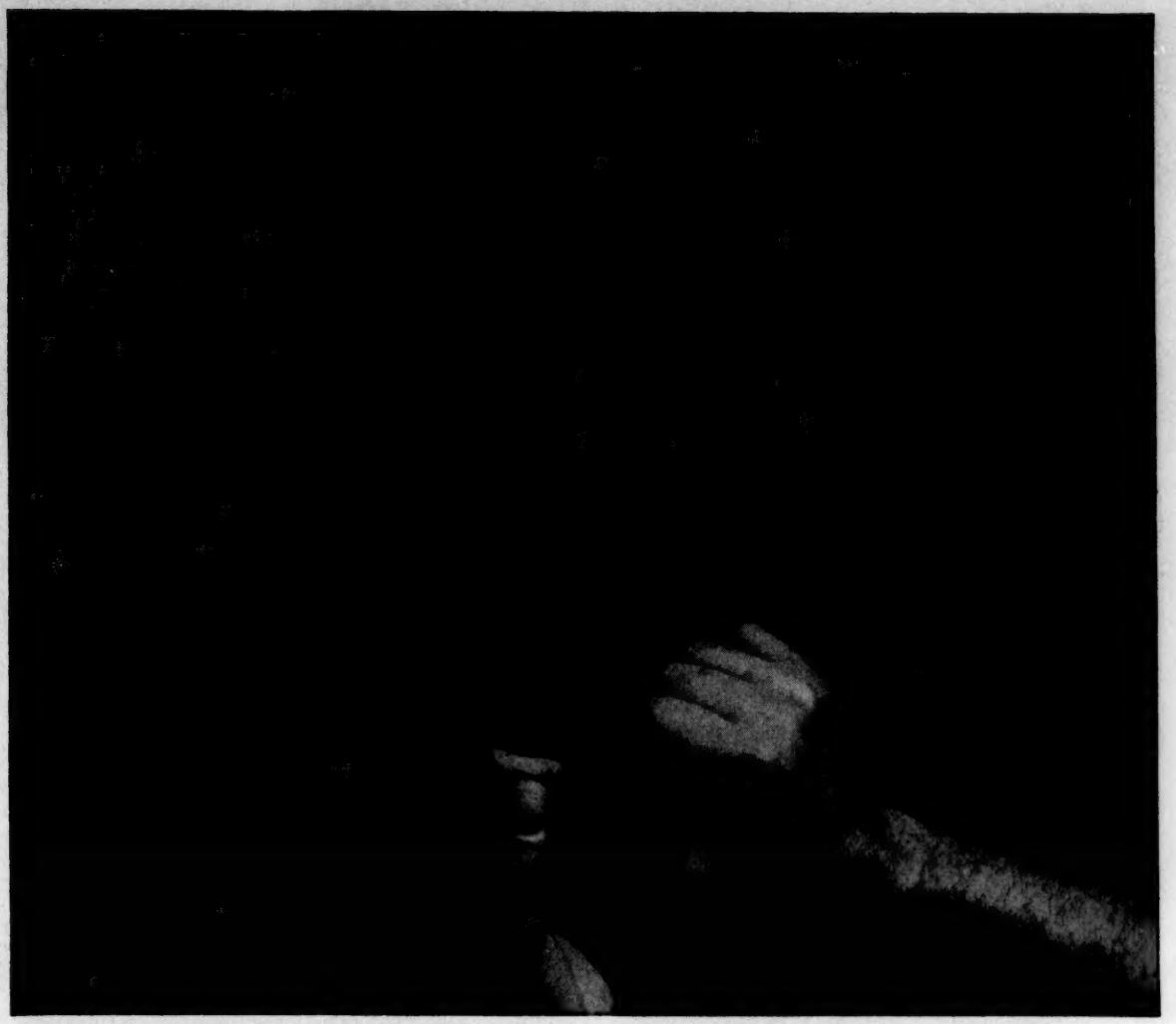
Libby Sells Salmon Plants

Libby, McNeill and Libby, Alaska's second largest salmon packer, sold all of its canneries in the new state in mid-February, according to Fergus Hoffman, Business Editor of the SEATTLE POST-INTELLIGENCE. Libby transferred its properties to a new company jointly formed by Columbia River Packers Association and Ward's Cove Packing Co. The new corporation will be known as CWC Fisheries, Inc. Libby recently announced construction of a new canned meat plant in Chicago. Bids were taken in March on the construction which involved 15 refrigerated rooms in an area 240x180x 20 feet, ranging from 70 to minus 10 F.

NIA Executive Muckerman, Dies

Prominent St. Louis business man and president of the National Ice Association, Richard C. Muckerman died in St. Louis March 15, according to the UNITED PRESS INTERNATIONAL. He had just returned from a visit to the West Coast.

Muckerman had been re-elected president of the Ice Association at their meeting last November, the first officer to repeat a term in some time. An avid sports enthusiast, Muckerman was the owner of the St. Louis Browns, predecessors of the Baltimore Oriole American League Baseball Club, for four years. He is survived by his wife and a son.



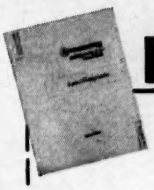
An Armstrong Armaflex specification means a low-cost, dependable pipe insulation job

A lot of pipe insulation specifications have become old-fashioned since Armstrong Armaflex was introduced less than four years ago. In that short time, this flexible foamed plastic material has moved from the specialty class to a position of major importance in the insulation field.

The reason is simple. With Armaflex you get a neater, faster, lower cost, more dependable job than with traditional pipe insulations. Armaflex is recommended for all piping operating from 0° to 200° F. It is made in three thicknesses and in sizes up to 3″ IPS. Larger piping and equipment can be insulated with Armaflex sheets.

If you would like to compare your current pipe insulation specifications with the Armstrong Armaflex recommendations, send for the specification booklet today. This 12-page booklet contains complete Architects' and Engineers' Specifications and recommended Installation Instructions for the Contractor. Mail the coupon for your free copy.

Armstrong INSULATIONS



MAIL COUPON TODAY

Armstrong Cork Company
2204 Skye Drive
Lancaster, Penna.

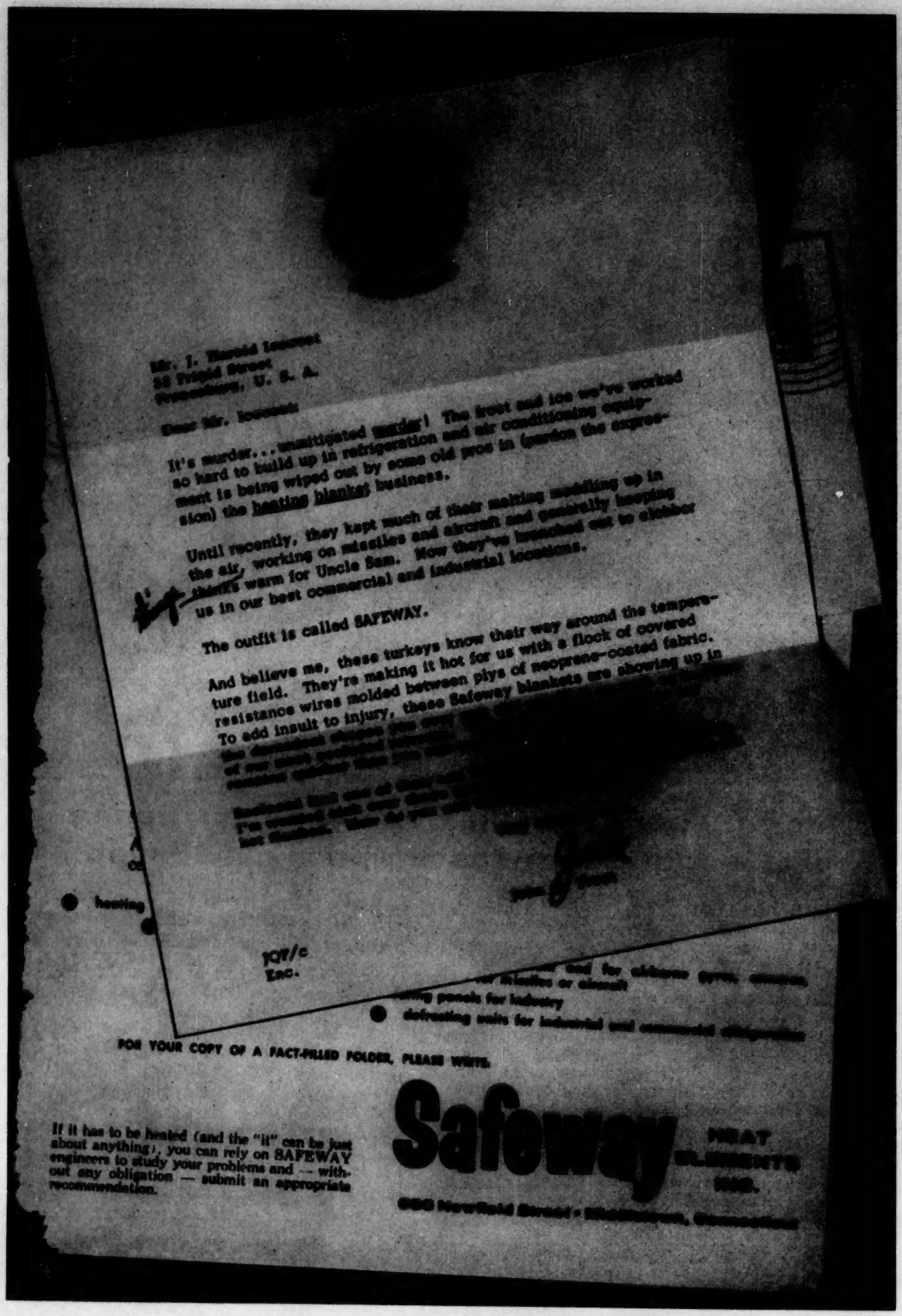
Please send me complete specifications on Armaflex without cost or obligation.

Name_____

Company_____

Street_____

City_____ Zone____ State_____


Mr. I. Harold Iceman
38 Frigid Street
Frostbite, U. S. A.
Dear Mr. Iceman:
It's murder...unmitigated murder! The frost and ice we've worked so hard to build up in refrigeration and air conditioning equipment is being wiped out by some old pros in (pardon the expression) the heating blanket business.
Until recently, they kept much of their melting meddling up in the air, working on missiles and aircraft and generally keeping things warm for Uncle Sam. Now they've branched out to clobber us in our best commercial and industrial locations.
The outfit is called SAFEWAY.
And believe me, these turkeys know their way around the temperature field. They're making it hot for us with a flock of covered resistance wires molded between plys of neoprene-coated fabric. To add insult to injury, these Safeway blankets are showing up in
jqr/c
Enc.
FOR YOUR COPY OF A FACT-FILLED FOLDER, PLEASE WRITE.
If it has to be heated (and the "it" can be just about anything), you can rely on SAFEWAY engineers to study your problems and — without any obligation — submit an appropriate recommendation.
Safeway
HEAT
ELEMENTS
INC.

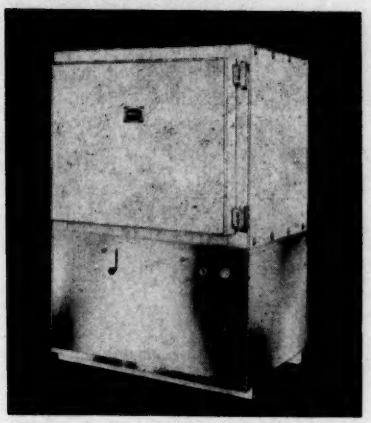
What's New

MACHINERY
APPLIANCES • PROCESSES

NAFFP Featured Equipment To Hold Time-Temperature-Tolerance Specs

REFRIGERATION equipment for freezing, storing and transporting frozen foods made up approximately one quarter of the exhibitions at the Annual Exposition of the Frozen Food Packers Association which held its convention in Chicago early in March. Continuous and package freezers, new and improved, were displayed; refrigerating systems, packaged or factory assembled, were featured; new forms of insulation and their applications were emphasized; and improved heavy duty refrigerating units to meet the requirements of a much tightened and temperature sensitive frozen food distribution industry, were introduced by manufacturers specializing for transportation.

Double Contact Freezer



FIRST PUBLIC SHOWING of the latest addition to Dole Refrigerating Co.'s "Freze-Cel" line was the self-contained double contact food freezer introduced at their Booth 86, NFFPA Exposition. The machine was operated at the show under simulated loads.

The freezer has six stations with a net freezing area of 40 4x5-1/2-in packages per station. Maximum opening of each station is 3-3/8-in. Plates in the freezing stations use square tubes for maximum prime surface contact.

Cabinet is insulated with Styrofoam panels and the freezing section is finished inside and out with vinyl, while the balance of the cabinet is in stainless steel. Refrigerant 22 is used in an injector type distribution system, using a surge drum similar to full flooded systems. The compressor is a water-cooled semi-hermetic. The plates are lifted by hydraulic pressure, the pump being contained in the machine compartment as a part of the cabinet.

Net weight of the freezer cabinet is 2300 pounds. Stripped of doors and hardware, the unit can be moved through the standard 36-in doorway. It has built-in skids and the only connections are power, water and drainage.

Continuous Package Freezers

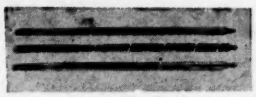
CYCLOMATIC is the name applied to a new continuous package freezer designed for ice cream or frozen food. Handling up to 900 gph of ice cream or 4000 lbs/hr of frozen food, automatically, the apparatus is said to be low cost in installation due to the fact that it operates without an insulated enclosure.

This fast freezing machine incorporates a new concept of freezing by using vertical plates and applying pressure against the frozen food or packaged ice cream, to obtain a more even heat transfer. Seven full flooded refrigeration plates, using either ammonia or halocarbon refrigerants, effect the rapid freezing of product. The machine is said to require 80 minutes to harden half-gallon packages of ice cream and 35 minutes for pints. The faster freezing rate is designed to produce ice cream of a finer texture and higher quality frozen foods.

Approved Solder Alloy

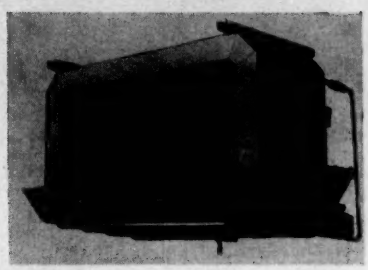
COMPLYING with pure food laws and reported as non-toxic, a New York firm has introduced a new alloy said to be excellent for high capillary joining of stainless steel and aluminum, or any combination of 7 other metals. A finished joint of this alloy can be chrome plated. The material may be used with torch or soldering iron and offers excellent corrosion resistance.

Temperature Indicators



TEMPERATURE MEASUREMENTS of minus 70 F are possible with mercury-thallium filled thermometers developed especially for low temperature by a Philadelphia instrument company. Stocked in seven models, the thermometers are finished with a yellow back for quick clear readings in lengths from nine to 18-in. Advantage of the mercury-thallium thermometer is that the amalgam leaves the bore clean; eliminates condensed droplets.

Hot Gas Defrost Coolers



KRACK has introduced a new series of hot gas defrost product coolers. Available in multiple and single fan models, the units are particularly adaptable to frozen food warehouses, sharp freezers, and ice cream hardening rooms. Four ceiling types are available in 28 models for use with halogen refrigerants or ammonia. The new models by Refrigeration Appliances, Inc., Chicago, are equipped with heavy duty motors.

Flow Controls And Instruments

RELEASED SIMULTANEOUSLY with the frozen food industry's annual meetings and shows, was a considerable amount of literature on new equipment, including process flow controls and instruments. A Cincinnati firm announced a pilot operated pressure reducing valve with self-lapping and self-cleaning sliding gate and plate seat capable of handling 2300 gpm, water. Available in 4- and 6-in sizes, this diaphragm motor valve is suitable for handling air, steam, water, oils, gases, chemicals, liquids and other process fluids which require accurate control of pressure, temperature, rate of flow or liquid level.

EXPRESSLY DESIGNED to meet the requirements of all types of frozen food cabinets and cases is a dial thermometer introduced by a Skokie, Illinois firm. Compact but with an easily read 2-1/2-in. dial, the thermometer has a range from minus 20 to 60 F and is equipped with a 5-1/2-ft nickel plated capillary tube and 3-1/2-in. stem. A special feature permits instrument adjustment to desired reading angle.

(Continued on Page 37)

Liquid Freezing -Its Successful Application

D. BROWNLOW, Produce Supt.
Saskatchewan Co-operative
Creamery Assn. Ltd.

Presentation To
The 30th Fact Finding Conference
Sponsored by the
Institute of American Poultry Industries,
Municipal Auditorium, Kansas City, Mo.
February 14, 1959

Thorough Freezing, Uniformity of Color,

▶▶ IMMERSION, liquid spray or liquid freezing of poultry has been reported on from various research studies, but operational reports to the poultry industry are indicated as being practically non-existant. Author Brownlow offers:

"To our knowledge, the first discussion on immersion or liquid freezing of poultry or turkeys at a Fact Finding Conference, took place two years ago, and was in the form of a panel. At that time there were probably only about half a dozen units in use anywhere for that purpose.

"Only a few more units had been installed when Howard Richey of Ellsworth, Iowa, gave his excellent talk, titled 'Our Experience with Immersion Freezing' at the 1958 Fact Finding Conference.

"Since then quite a number of additional units (both in Canada and the U.S.) have been installed and operated this past season. We (the Saskatchewan Co-operative Creamery Ass'n., Ltd) feel there is good reason for the tremendously increasing interest in liquid freezing of poultry."

▶▶▶ INTEREST and investigation of liquid freezing on the part of Saskatchewan Co-Operative Creamery Association Limited, dates back over three years. By last Spring, the Co-op was satisfied that it was necessary equipment to maintain and improve the sales appeal and consumer acceptance of its brand-name. As a result, SCCA installed liquid freezing units in the plants. After four months of use and the handling of millions of pounds of liquid frozen turkeys, chicken and fowl, the Co-op is convinced that the investment was more than justified.

Prime advantage of liquid freezing is that color, to any degree of whiteness can be uniformly attained with a minimum effort and cost. With the SCCA set-up, no extra labor is required to load or unload the tank. Tank capacity is approximately 9,000 lbs of turkeys per hour. Production uses a liquid temperature of 0 F, which is maintained by a 7½ x 7½-in compressor in a single stage system. Past experience would indicate that air blast initial freezing would require at least double that compressor capacity to do a less than comparable job as to color; and above all, uniformity of color.

Minimum Seepage

Another major point in favor of liquid freezing is that seepage in the bags can be almost completely eliminated due to the extremely fast surface freezing.

Container Advantages

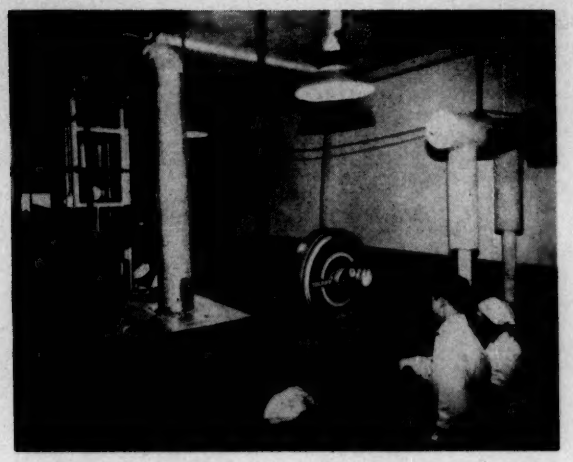
There are still other advantages —not necessarily universal, depending on individual plant procedures. Produce Dept. at SCCA likes the fact that the important initial freezing is part and parcel of the complete processing operation. Color of our finished product is under the surveillance and control of regular plant supervisory personnel.

Furthermore, by using a full telescope carton with side vent holes, personnel can complete the packing operation before the finished product goes into the hardening freezers. Previously, the Co-op used more expensive post type cartons and had the trouble and extra labor cost of lidding and marking the cartons after they came out of the blast freezer.

Operational Improvements Achieved By New Method

In past years the SCCA had to operate its blast freezers at as low a temperature as possible, ranging from minus 20 to minus 40 F with high air velocity. Now product hardens or finishes freezing in rooms at minus 10 to minus 15 F with only moderate air movement. The sum total of difference in the SCCA case is a better colored product to sell (for less labor cost), slightly cheaper cartons, less rigorous working conditions for freezer room staff, and, finally, more efficiency out of the compressors working at higher temperatures.

Complete creamery and produce facilities of the Saskatchewan Co-op Creamery Assn. Ltd. are located throughout Saskatchewan. Head office is at Regina.



Entrance end of the liquid (immersion) freezing tank at Saskatchewan Co-operative Creamery Association, Regina. Packaging line parallels the brine unit, ending with the shrink tunnel in left foreground. Wrap-sealed birds are weighed, marked and released into the liquid freezer, right.

Exit from the liquid freeze tank is shown in the left foreground. The electric motor driven lifter governs the length of time which the birds spend in the tank. Operated through an automatic timer which is adjusted from a few seconds to 4-minute cycle. Lifter can also be operated manually.*

Improves and Maintains Sales, Consumer Acceptance

Applicable to Other Products

So far, at least by inference, the author has talked only of freezing turkeys. The same points already mentioned apply also to chicken and fowl. Because of smaller carcass size and the fact that the Co-op's primarily turkey processing lines cannot duplicate hourly turkey tonnage, even better freezing performance from the liquid freezer is achieved. Chicken and fowl stay in the tank somewhat longer; are more completely frozen.

Tray Product Experience

Liquid freezing is equally useful for packaged or tray cut-up product, such as parts of chicken or turkeys, cut-up frying chickens, fricassee fowl or what have you, with one important proviso. Obviously, the product must be encased in a moisture-proof covering such as *Cryovac*. Production has experimented with *Cryovac's* tray-pack cut-up chicken, but so far SCCA is content to stay with more conventional and cheaper heat-sealed overwraps and blast freezing. It must be admitted, however, that the liquid frozen product has more general consumer appeal.

Planning The Application

Any specific discussion on cost involved as to installation and/or operation of liquid freezers is difficult, due to so many variables. Therefore, the following is only an attempt to maintain some of the more important points to be considered:

Most important point is that under no circumstance should a poultry producer consider using a liquid freezer for minimum crust freezing, unless he has adequate capacity conventional freezers near-by. Obviously, the less time between the two the better, but certainly more than one hour time lapse is asking for trouble.

To the Co-op' knowledge, there are basically two types of liquid freezing units available:

(1) A unit where the birds are floated (partly immersed) through the tank, with pumped sprays of solution to freeze the exposed portion of the carcasses.

(2) A system whereby birds are carried through the freezer on a positive slat type conveyor, only two to three-inches submerged, to assure freezing of backs and wings. The balance of the carcass is frozen by means of a very heavy rain of solution from perforated pans above.

Some units have refrigerated coils right in the main tank; others use a separate heat exchanger. In all cases, large capacity pumps are used to keep the solution moving at a fairly high rate in order to maintain uniform temperature.

Choice of Solutions

Any kind of solution can be used in the first mentioned type of liquid freezing units. With the second type, using a conveyor to carry the birds, only a non-corrosive solution should be used.

All liquid freezers that Co-op personnel have seen or heard of do a good job of freezing.

A decision as to what kind to buy would no doubt take into account: initial installed cost (not forgetting the important service angle from the supplier), floor space needed, pump motor requirements (which vary from a low of about 10 hp to about 30 hp), initial and loss make-up cost of the solution used (sodium chloride being the cheapest, and propylene glycol the most costly).

Selecting The Tank

There are, of course, other factors to consider before deciding on the type of tank or the solution to be used in it. The producer would also be influenced by the degree of freezing and/or color desired from the liquid freezing unit. For more or less complete freezing in the tank and/or chalk white color, the poultry operator should not use sodium chloride, because it freezes at minus 6 F. He generally chooses calcium chloride, which freezes at minus 46 F.

Propylene glycol solution would not likely be suitable because of its high viscosity at low temperature.

*For the curious or non-poultry producing reader, the odd looking shapes at right side of the illustration are turkeys hanging from a drip line, the start of the same packaging line mentioned in the legend to the first photo.

Sodium chloride being very corrosive presents some problems in maintenance of the liquid freezing unit and adjacent equipment. Propylene glycol would present no problem in this respect.

In the case of leaking bags, of which there will always be some, propylene glycol is non-toxic; in fact, it is used as a food preservative, blender, etc. Calcium chloride on the other hand is toxic, and might occasionally result in a whole bird being condemned in the case of a bad leaker where the body cavity filled up with the solution. In all cases, regardless of solution used, leakers observed at the end of the liquid freezing operation have to be at least partially thawed, washed and re-bagged.

Partial Freezing In Tank

Most present users of liquid freezers do not attempt to do the complete freezing job in them. Rather, they run the bird through the tank for varying times (usually 30 to 40 min.), thereby attaining a so-called 'crust freeze', which amounts to about the first 1/2-in depth frozen hard. another 1/2-in or more is frosted, and the cavity temperature is a uniform 32 F. The finish freezing or hardening can then be done in a conventional freezer at minus 10 F or lower with at least moderate air movement, using vented boxes with spaces between piles, or boxes without lids, or on trays.

In the SCCA opinion, continuous 'crust freezing' is the most practical method of operation in any volume for several reasons: Complete freezing in any reasonably sized tank would have to be on a batch basis rather than continuous—this would interfere with continuous packaging; or the producer would immediately have a seepage problem—packing in master-cartons could only be done at intervals; thirdly, a blast or holding freezer where production can pile many cartons high is no more economical of floor space than using a tank large enough to permit a continuous operation.

Leakers Major Problem

There is in the opinion of the Co-op, only one disadvantage of liquid freezing, and that is the problem of leakers. First it should be understood that liquid freezers do not cause bag breakage; but they do show up a lot of fractures, pin holes, insecure bag clips, etc., which are missed or ignored with air freezing. Fortunately, though, leakers can be controlled to within reasonable limits by using reasonable care in bagging, vacuumizing, clipping and otherwise handling prior to entering the liquid freezer. After the break-in period, last fall, during which the Co-op personnel learned many things the hard way, SCCA was able to control leakers between 1/2 to 1 percent to rarely more than 1-1/2 percent of birds processed in any given day. However, this extra cost and inconvenience is more than compensated for by the good points of liquid freezing.

The following excerpt from a letter from the Co-op's oldest and most valued customer, and incidentally one of the largest volume turkey retailers in Canada, serves to sum up SCCA's satisfaction with liquid freezing:

"We have enjoyed an exceptionally good Christmas movement of turkeys again this year, and we feel on the whole the quality and pack was a decided improvement over former years".

Freezing Tank Data

Liquid freezing units employed by the Co-op are 8x40-ft long overall, including two feet for the washer and belt conveyor at the exit end. The main tank is 38 inches high and is insulated on bottom, sides and ends with four inches of cork board insulation. The cover is made of corrugated plastic panels on wood frames in order to contain the splash.

Approximately 270 umbrella type pressure sprays are located under the covers and above the birds, for freezing the portion of the birds which is not resting in the solution. Fully charged, the tank holds 4500 U. S. gallons of brine solution.

Turkey Holdings In U.S. Storages

▶▶ INVENTORY figures on classes of turkeys in storage on January 31, have been released by the Institute of American Poultry Industries. Over 99 million pounds was reported. This does not include any turkeys held in other than public warehouses.

The semi-annual report, said Harold M. Williams, president, was compiled from figures received from 206 warehouses (compared with 265 last year), members of the National Association of Refrigerated Warehouses, Inc. The reporting warehouses are located in 176 cities and 37 states. An additional 39 warehouses reported no turkeys in storage (compared with 47 last year).

"The value of this report," said Mr. Williams, "lies in the percentage figures for the different classes of turkeys, which can be applied to U. S. Department of Agriculture total storage holdings for January 31.

Liquid Freezer Marketed By English Manufacturer

▶▶ PACKAGE immersion freezers for poultry have created considerable interest in the past 18 months in Great Britain according to MODERN REFRIGERATION, February 1959. One manufacturer is I. F. Eyles, Limited, at Chalford. This firm has been producing a basic form of freezer fitted with two shells for dry expansion evaporators hooked up to two entirely separate circuits each having a refrigeration capacity of 30,000 Btu hr, using Refrigerant 12. The poultry freezer is designed to operate at minus 5 F with 4-hp brine pumps. The tank can be produced in increments to give the freezer 120,000 output Btu/hr.

Details on the circulation of brine by means of a sparge pipe, a specially constructed conveyor belt, batch release gate, rate of feed and belt travel are given in a 2-page article with an illustration. Experience gained in the manufacture of poultry freezers was related in the article, with the manufacturer pointing out that the economical compromise was a freezer tank of 2,000 gal. It was also pointed out that the size of the tank was also pretty much regulated by the type of conveyor belt selected. Price of the conveyor belt is not directly proportional to its width, but increases pretty rapidly per unit foot after a width of 6-ft has been reached.

Poultry Drip Tests

▶▶ PURDUE UNIVERSITY Researchers announced recently that different freezing methods apparently have no effect on the amount of thawing, drip, cooking loss or tenderness in frozen tom turkeys. MEAT MAGAZINE reported that the University technologists had tried liquid dip, plate and moving air freezing methods in their experiments.

Turkey Icing

▶▶ POUND FOR POUND is the ratio recommended by FARMER COOPERATIVES for icing fresh turkeys. The ratio is based on a practice at a Texas Coop which says growers have benefitted from 3 to 5 cents a pound since it began marketing on the basis of a pound of ice for a pound of turkey.

Kenya Meat To Persia

▶▶ ANOTHER new year development in foreign export is the shipment of quick frozen pre-packaged meat from Kenya to Persian Gulf. Orders exceed refrigerated space on ships in the trade.

Refrigerated Warehousing - Research News

Alford In Corpus Christi

GROUND BROKEN . . . Wielding shovels, left to right, are Fred Alford, Jr., president of Alford Refrigerated Warehouses of Corpus Christi, Inc.; Fred Alford, Sr., president of Alford's in Dallas; Corpus Christi Mayor Farrell Smith, and Corpus Christi Chamber of Commerce President Joe Wolff.

▶▶UNDERWAY in Corpus Christi, Texas, is the second refrigeration giant by Alford. Alford Refrigerated Warehouse at Dallas, constructed in the early '50's received wide publicity for a number of innovations. The new plant on the Gulf will incorporate a number of these unique ideas which have proven successful in the original plant.

Fred Alford, Jr., is president and general manager of the new firm which will carry the name Alford Refrigerated Warehouse of Corpus Christi to differentiate it from the Dallas installation. Alford, Jr., retains his position as vice-president and assistant to the president of the Dallas firm, however.

Distribution Center For Frozen Foods

The capacity of the Corpus Christi plant will be over one million cubic feet. From the time initial plans were put together on the drawing board, until the ground was actually broken, said Alford, the size of the warehouse was boosted 50 percent. It will be 240x350 ft and will serve the fast growing south and coastal Texas as a frozen food storage and distribution center.

First firm to begin construction in Corpus Christi in 1959 is the Alford organization. First construction is being done by Texas Bitulithic Company, grading and filling of the warehouse site to car floor and truck bed levels. The building will be of steel and concrete construction, heavily insulated. Ceilings will be 22 ft.

Facilities will include an Alford-patented jet-blast freezer capable of processing 100,000 lbs/day. Alford stated that the firm contemplates seafoods as the principal product to be serviced, but expects other items to be eventually processed and frozen in the plant. Citrus concentrate and perishables were reported to be coming in for their share of attention.

Alford Jr., and family, have established a new home in Corpus Christi. As president of the new firm, he will supervise construction and eventually operate the new plant.

Young Alford is a graduate of Southern Methodist University, in engineering and management studies. At the age of 28 he will have an opportunity to apply practical knowledge and experience gained in operations, research, personnel management at the Dallas plant which Fred Alford, Sr., established as the world's largest refrigerator a decade ago.

Defense Instructions

▶▶SURVIVAL in the event of a nuclear attack will depend to a great extent upon the ability of American industry to protect its employees and plants, and continue or restore production. Course conducted by the Office of Civil Defense Mobilization March 9 to 14 in Battle Creek, Michigan, dealt with preparedness.

USA Opens German Plant

▶▶OFFICIALLY opened on March 4, was a $2 million dollar cold storage plant for the U. S. Army at Kaiserslautern, Germany. The plant is capable of storing 15,000 tons of perishables for American Service men and their dependents. It replaces older plants at Frankfurt, Mannheim and Munich.

Ice Cream Manufacturers Establish Research Budget

▶▶SUBSEQUENT to the report in the March issue, *Industrial Refrigeration*, that the International Association of Ice Cream Manufacturers, the Milk Industry Foundation, and the American Dairy Association had established a joint market research committee, it was learned that the committee had held a mid-February meeting. At that conference, presided over by I. N. Hagan, IAICM President, a total budget of $140,000 was alloted to study and survey consumer attitudes and behavior toward ice cream and milk, as well as to measure consumer use of the two foods.

Americans on DSI

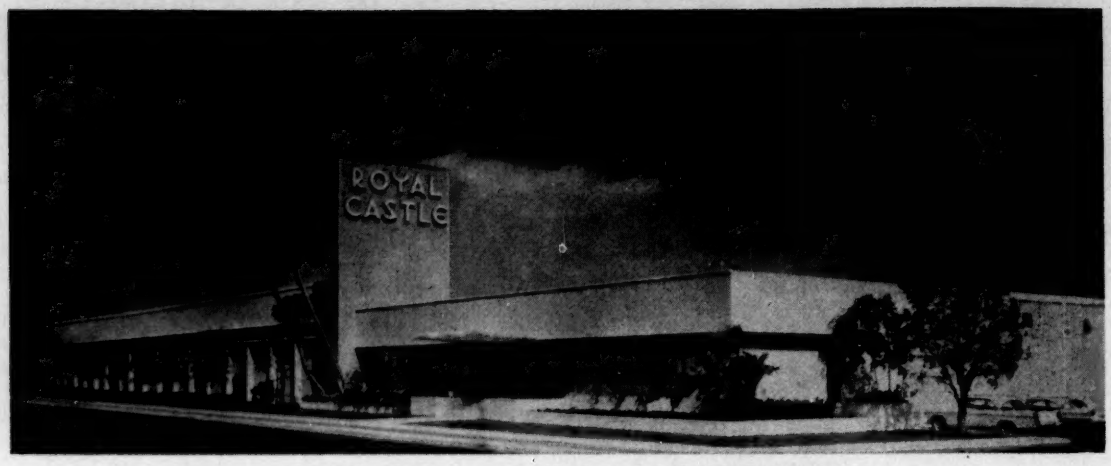
▶▶PICKED as President from among its world-wide membership, at the meeting of the Dairy Society International for 1959, is George B. Pfeifer, North Star Dairy, St. Paul, Minn. He succeeds Bernie F. Beach, Michigan Producers Dairy Co., Adrian, Michigan. Vice-president is Lyman D. McKee, Madison, Wisc., president of the American Dairy Association. Treasurer is Roy Cairns, Waukesha Foundry Co., Waukesha, Wisconsin.

New Holding Cooler Improves Operation

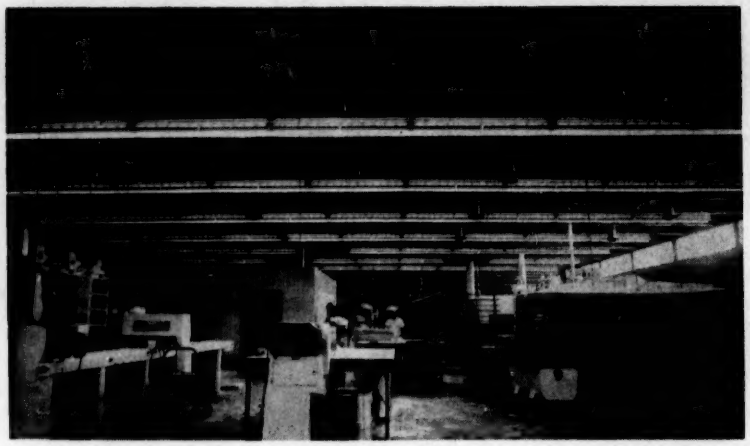
▶▶CALAVO'S avocado growers are maintaining a fruit quality reputation, through the addition of automatic humidifiers in precoolers and holding coolers. James A. Phillips, production engineer, in an article in the CALAVO NEWS wrote that introducing moisture continuously in the cooling rooms prevents the field boxes and flats from extracting moisture from the fruit. This is important, he wrote, because a wooden or corrugated container may absorb from 11 to 30 per cent of its weight in water during the time it is in the cooler.

The Escondido and Santa Paula plants of Calavo are now equipped with precoolers and holding coolers for maximum quality control. All incoming fruit is immediately placed in precooling rooms for removal of field heat. The holding cooler rooms maintain the packed fruit at a satisfactory range for shipping.

Phillips also wrote that Calavo is maintaining a practice of car and truck cooling operations before loading. This enables the transportation firm to carry the fruit to all parts of the country within a specified range of temperatures, using only the refrigeration equipment customarily serving the vehicle.



Royal Castle System, Inc. Commissary, Hialeah, Florida.



View of bakery department from batch weighing and ingredient mixing station. At left is the donut department. Tile structure left of center is one bake oven. This area of the production floor is air conditioned. Air is delivered through circular ducts and diffusers placed in the trusses.

Executives of the Royal Castle firm pay one of their many daily visits to a food department during a receiving period. Chuck and plate sections of beef quarters are pictured on the trolleys. William Singer, Jr., left, discusses a matter with a technical aid. Cylindrical object above and between executives is a sump pump on the evaporative coil which removes defrost condensate automatically. Low head room prevented placement of unit and drain piping above the rails.

▶▶▶"HE BUILT A CASTLE ON A HAMBURGER and it has proved a sturdy foundation," was the way Lawrence Thompson, *Miami Herald* Staff Writer, described William D. Singer, and his Royal Castle Chain. The occasion was the opening of the new Royal Castle Commissary, one of the most modern in the nation, in Hialeah (Miami, Florida), July 1958.

That sturdy foundation consisted of more than just hamburger, commented the National Association of Practical Refrigeration Engineers, visitors at the Royal Castle plant during a convention tour made last November 1958. Quality products, cleanliness, up-to-date business methods and food processes, and most important of all, skillful personnel handling and advertising, have been the other ingredients which have held the hamburger foundation firm, and upon which the rest of the Castle was able to grow.

Bakery Air-Conditioned

Feature of the new commissary which interested the refrigerating engineers and their families, was the air conditioned bakery and the many refrigeration applications used in bakery processes. Said to be the first air-conditioned bakery of its kind, together with the meat plant, vending and the syrup departments, warehouse facilities, general offices and even a theatre, the commissary is considered a showpiece. It is considered the capitol of the nearly 60 Royal Castle hamburger shops (Castles) in South Florida. The firm also operates in the City of New Orleans, Louisiana.

Overall building size is 450 x 145 ft, affording some 70,000 square feet of floor space, since there are several mezzanine or second levels. The plant is situated on a 5-acre tract which

ROYAL CASTLE SYSTEM, INC.

where

Quality Hamburger Retailing Requires Varied Refrigeration

--From Beef Cooling and Bun Production, thru Transportation to Customer-Employee Comfort, There-Are Literally Over a Baker's Dozen Applications—

provides ample truck access for the commissary to handle refrigerated delivery vans. One of the Castles is located on the commissary tract. Supervision of operations is under the skillful guidance of Gerald Lamb, Commissary Manager.

Modern Materials Handling

The plant is laid out on a modified direct flow basis. Raw materials and supplies, with the exception of meat, is received from railway cars and trucks at the far end of the 450 ft. structure's rear. With the exception of the yeast, syrups, fruit and other perishables, the bakery ingredients are stored in the non-refrigerated warehouse, as are packaging materials. From there they flow to the point of use except those supplies going directly to the Castles.

Heat and Hygiene Protection With Enclosed Shipping Dock

Meat is received at the opposite end of the 450-ft. rear dock where it moves directly into coolers and holding rooms. After production or processing, food products move to the delivery vans over a shipping platform located between the two receiving stations. All loading and unloading of truck trailers is behind closed doors protecting the food products against heat and contamination.

Model Bakery Operation

Principal bakery lines are hamburger rolls, half a dozen variety of donuts, a large variety of Danish goods and several kinds of pies. Each of these products involves use of refrigeration in many process stages. Heaviest tonnage, of course, is in the air conditioning applications for the bakery plant.

The bakery has its own separate air conditioning plant. Head baker, Harry S. Morris agrees with the management, architect and consulting engineer that the air conditioning plant was a must to the successful operation of the baking enterprise. Air conditioning is essential in controlling heat and relative humidity on the processing floor, and working with the various doughs.

Although there are daily tours of this plant under the supervision and direction of the advertising staff, managed by William Izzard, the NAPRE visitors were treated to a much greater detail. For example in the bakery tour, advertising staff, bakery personnel and maintenance engineers teamed up to spell out the refrigeration applications. The ladies especially learned how important refrigeration is to successful baking.

Refrigerated Processes

On receipt of such raw ingredients as butter, eggs, yeast, cheese, fruits and nuts, they are all moved immediately to refrigerated storage. Pie and Danish fillers, such as apple, pumpkin, mince, and syrups such as the chocolate and lemon are also refrigerated at cooler temperatures.

Second application of refrigeration observed was at the scales. Weighing of dry ingredients for rolls and pie crust does not involve refrigeration. However, visitors were surprised to learn that dry ingredients for the donuts and Danish did require refrigerated weighing machines. The ingredients are held at the weighing station as additional items are added, which accounts for their refrigeration.

In the mixing of ingredients, refrigeration plays a part in all four major Royal Castle bakery products. Donuts, Danish and pie doughs are refrigerated by an intricate sweet water system, whereas (bread) hamburger roll mixing temperatures are controlled by direct expansion. From the mixing phase, the bread dough proceeds to the fermenter which is also under controlled atmosphere. From there it goes to the roll and divider which operations are in the open but nevertheless under the controlled atmosphere of the air-conditioned bakery production floor.

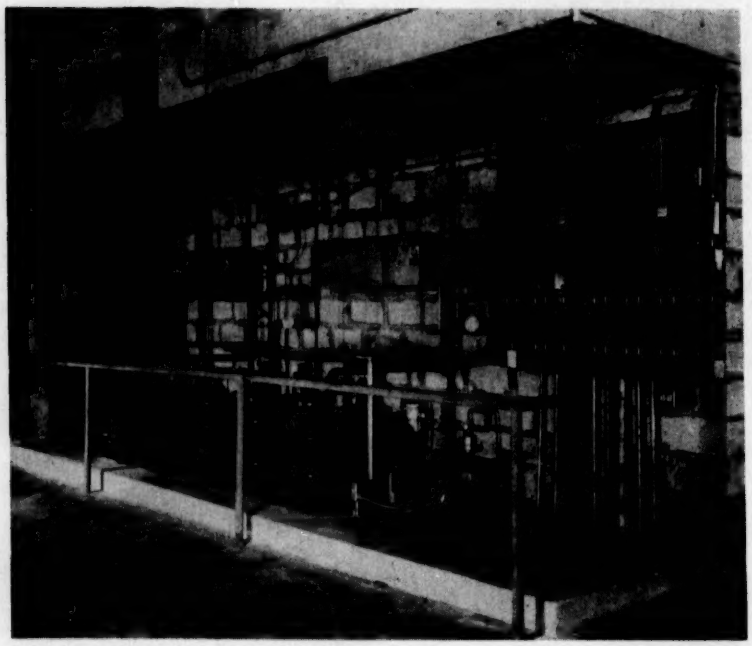
"Fit for a King" says the legend on the Royal Castle Hamburger hat, but this little queen finds them pretty tasty too. Refrigeration not only helped make them wholesome eating, but enables her Daddy to pay for them too.

Chilled Hold-over

After make-up, Danish and pie crusts are refrigerated overnight. Pie fillings are cooked and refrigerated overnight. Proofing of rolls and donuts, and the baking and storing of these two lines respectively does not involve refrigeration. Neither is refrigeration involved in the garnish or baking processes for the Danish or pies.

Knowing Each Job Importance to Product Promotes Inter-Department Cooperation

DEPARTMENT HEADS WORK OUT MAINTENANCE DETAILS TOGETHER: Harry Morris, Bakery Manager, Charles Moneypenny, Chief Engineer, Carl Nickels, Meat Manager, discuss mutual refrigeration interests — servicing.



Bakery equipment requiring refrigeration is served by over a dozen units, half of which are located in this station in the dry storage warehouse. Multiple units of the same size and make, plus a number of cross-connections provide interchangeability of parts and standby equipment.

However, both Danish and pies are placed in refrigerated coolers using a direct expansion system where the temperatures are reduced, prior to baking. Rolls and donuts are air cooled in the 20-ft. high bakery on tiered conveyors prior to baking. Transportation of all bakery products to the Castles is by refrigerated vans.

Meat Plant Inspected

Visitors from the NAPRE convention to the Royal Castle Commissary were more familiar with the setting they inspected in the meat processing department. Beef, bacon and cheese is received and moved to coolers and holding rooms. When extra large shipments are received, portions are shifted to sharp cooler storage. Combined holding capacity is 90 tons.

Bacon is received ready-sliced to specification but packaged at the Commissary. Large quantity cartons are broken down for making up the separate Castle orders.

Cheese is also sliced to specification, being received in bulk packages. Small quantities are assembled for shipment to the 60-odd retail units.

All-Beef Hamburgers Are Double-Ground

Beef, however, involves actual processing. Chuck and plate (the missing item to make up a quarter would be brisket) are weighed in and placed in the holding cooler. The L-shaped room adjacent to the holding cooler, at refrigerated temperatures, is arranged for boning, grinding and patty manufacturing. The prepared hamburgers are then packaged and placed in the coolers for shipment to the Castles, daily.

A feature of the Royal Castle hamburer is the double grinding. It is a two-stage operation without re-handling, an idea attributed by the management to the head butcher, Carl W. Nickels. Of course, refrigeration obviously plays a part in the meat handling scheme from a refrigerated semi-delivery to the receiving dock, to holding, to processing, to cooler storage and by refrigerated van delivery to the retail units.

Multiple Units Applied To Bakery and Commissary

Air conditioning of the 80 x 200-ft. bakery floor is only partial. Those areas where the actual preparations of the ingredients, working with the dough, proofing, etc. up to the bake ovens, are air conditioned. Beyond the ovens the bakery is equipped with ventilation only. It is in this area that the bun and donut cooling conveyor tiers and racks are located, just ahead of packaging.

Water Washed Air Mixed In Special Plenum Room

Two 40-hp multi-cylinder Refrigerant-12 units provide refrigeration for an air cooling unit located in a special plenum room. Coils are direct expansion, numbering four. There are also two steam-heat coils. The air is washed by water spray. A 7-1/2-hp motor serves the multiple fan assembly and a 1/3-hp pump circulates the water. About 40 percent of the air is returned from the bakery production floor and 60 percent fresh air is mixed with the return air in the plenum room ahead of the coils and air washer.

Mezzanine For Machinery

Air conditioning compressors, the plenum room and accessory equipment is located on a mezzanine over the fermentation and perishable ingredient storage rooms.

Located on that same mezzanine is a Brunner 7½-hp V-type compressor which services the water chiller. This is the chilled water used for the weighing or batching and dough mixing equipment. Another 5-hp Brunner unit which serves the direct expansion dough mixers is located on the same mezzanine. A 3-hp compressor is also located there, serving the needs of the fermentation room. Location of this apparatus on the mezzanine brings it in close proximity to the device requiring refrigeration, eliminating long pipe runs.

Warehouse Location Required Protection From Fork Trucks

On the main floor level in the warehouse along the 200-ft. bakery wall, is located the balance of the refrigerating equipment for that department. Again, this group location of equipment brings it close to the bakery devices which the various units serve, eliminating long pipe runs from a central machinery plant. The machinery is protected by a high curb and by rails at the two sides, and overhead by a mezzanine, from any damage that might occur from materials handling by the fork lift trucks.

Hamburger patty manufacturing room is pictured. This area is the foot of an "L" shaped refrigerated processing area. Chuck and plate, boned and cut for grinding in the other leg of the "L" shape, is served by the meat rail pictured at the far right. Carefully weighed and proportioned beef moves to the 2-step grinder in the far corner. From there the ground beef moves by conveyor to the patty machines. Machine operators package the patties for shipment to Castles.

This additional bakery equipment ranges from 1½ to 7½-hp. An additional chilled water unit serves four mixers and employs a 1½-hp unit. Ingredient storage rooms employ Brunnermetic one and 5-hp units, with a Kramer-Trenton Thermobank used in connection with the larger horsepower machine. The overnight semi-process holding cooler is served by a 3-hp Brunnermetic. A reach-in ice box for miscellaneous service is served by a ¾-hp Brunnermetic. The finished products coolers are served by 7½ and 1½-hp units of the same manufacture, with the larger unit employing a Thermobank also for defrosting.

Meat and Office Units In Third Compartment

Adjacent to the meat department is another arrangement of refrigerating equipment similar to that employed with the bakery process refrigerating machinery. However, this machinery is located in the emergency diesel generator room. Receiving and finished products coolers in the meat department are served by a 5-hp unit, the boning room by a 7½-hp, and the two beef holding rooms by 5-hp units each. The sharp cooler is served by another 5-hp unit. All compressors are Brunnermetics and all three lower temperature 5-hp units utilize Thermobanks for defrosting.

Compressors for the office and theatre air conditioning, together with the chilled water units and receivers, are also located in the generator room.

This 40 hp Refrigerant 12 compressor is one of two units serving the air conditioned Royal Castle bakery.

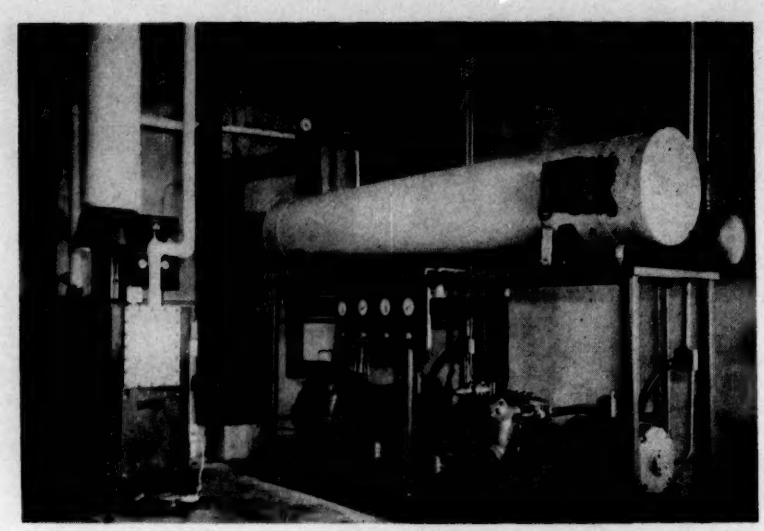
At right, an interior view of the plenum chamber. Air conditioning uses over 60 percent fresh air which is admitted through automatically controlled louvers placed in skylight. Air enters this 6-coil bank for cooling (and heating).

A small gas-fired hot water heater with a Bell & Gossett circulator is located adjacent to the air conditioning machinery. All are tied in with a zone type coil and plenum arrangement in an air conditioning equipment room located above the service and rest rooms in the main office building. Hot water, refrigerating coils and fans are all incorporated in one unit. Air return is to the elevated machinery room. After fresh air pick-up, the air passes through the coils and fans and out into the distribution duct.

Refrigerated Book-Keeping

There is one other refrigerating unit at the Royal Castle headquarters. It is located adjacent to the IBM bookkeeping and payroll machinery in the general office space. This compression refrigeration unit is 3-TR, and serves the accounting device, exclusively.

All refrigeration equipment condensing is accomplished by Kramer-Trenton Unicons on the roof of the plant. They total 11 in number, five of them being dual fan types.



Gas fired hot water heater at the left and two 15-hp compressing units which serve the twin coil water chiller, provide the heating and cooling requirements for the office and theatre comfort air conditioning system. Chilled water piping throughout the plant is insulated with Foamglas. Air conditioned areas are insulated with Fiberglas. Heat transfer to the cold storage rooms is retarded through the use of Styrofoam. Cold storage doors for bakery boxes and meat refrigerators are by Jamison.

Employ Maintenance Engineers

In charge of all machinery is Charles W. Moneypenny, designated by management as chief engineer. However, Moneypenny and his staff function more as maintenance engineers, having responsibility for the service and maintenance not only of refrigerating and heating equipment, but the bakery and meat processing machinery as well. Moneypenny is secretary of the Greater Dade County Chapter, NAPRE, and was convention chairman for the Association's Miami meeting last Fall.

Standby Power, or Shutdown

Few Florida industries will have a production plant as elaborate or as extensive as the Royal Castle System without some stand-by power arrangement. Royal Castle depends on two Caterpillar Diesels. These 1800-rpm, 195-hp each, machines supply sufficient power to keep every electric driven piece of apparatus in the Commissary running, with the exception of the four large air conditioning units. In the event of a hurricane or tropical storm it is unlikely that the air conditioning would be most essential.

An example of how important the diesel generators are, occurred during the plant visit. One of those quick short lived tropical showers came up and the Florida utility suffered a power failure. The diesels came on automatically and Moneypenny shifted the plant load to them. However, in the few seconds interval the donut fryer went out and before the emergency power took over—in those few seconds time—several dozen donuts were burned because of the flywheel effect of the hot grease in the fryer. Failure of the power driven conveyor through the fryer in only a few seconds browned the donuts too deeply.

Radiators on these standby diesel generators have been removed by the engineering department at Royal Castle since this picture was taken. Aluminum louvers reflecting the cameraman's flash bulb have also been removed and the wall area has been blocked up. Royal Castle management believes in keeping on good terms with its neighbors and resorted to the use of well water for cooling the diesel equipment. Removing the louvers and obtaining air for the diesel through special skylight wells helped eliminate noise nuisance.

General Mills Building

▶▶UNDERTAKEN early in February is a new one-story frame and stucco structure at Anaheim, California, which will serve as the headquarters office building of the Refrigerated Foods Division, General Mills. The new facility will provide expanded office space for the present division staff and include space for expansion of future operations.

Opening The Air Conditioning Season—

Successful Practice In 1959 Means Knowing Your Centrifugal Refrigeration Machine

By PAUL ELLARD

▶▶▶ INSTALLATIONS using large capacity centrifugal refrigerating machines far outnumber those using other types of refrigerating cooling systems in larger office buildings, institutions, and hotels for health and comfort, and in industries for process and production reasons. As an aid to understanding better the centrifugal water or brine chiller, presented herewith is a short course containing helpful instruction for operating and maintaining equipment in the practical engineer's charge.

TABLE 1 — OPERATING PROBLEMS OCCASIONALLY EXPERIENCED

Indication of Trouble	Their Causes
High Condenser Pressure	Water valves throttled - pump not operating - tubes or strainer plugged - tower not operating properly - tubes scaled - air in condenser - float valve stuck - broken division plate
Low Condenser Pressure	Water too cold - insufficient refrigerant charge
Suction Damper Operating Improperly	No control air - linkage or damper binding - controller not operating properly
Low Refrigerant Level	Float valves not operating - leak in machine or purge
Low Capacity	Condenser not performing properly - hot gas bypass valve open - excessive oil in refrigerant - brine flow not correct - division plates broken or by-passing - tubes scaled - speed not high enough - low refrigerant level
Compressor Surges	Light load - air leak - high condenser pressure
Low Oil Pressure	Dirty oil filter - oil pressure regulator out of adjustment - low compressor speed - low condenser pressure - excessive clearances
High Oil Pressure	Pressure regulator out of adjustment
High Bearing Temperature	Low oil cooling water flow - excessive refrigerant in oil - oil heater on - bearings damaged
Purge Not Operating Properly	Thermal overload burned out - high pressure cut out open - air cooled condenser fouled - shut - off valves closed - power off - belt broken - float valve stuck - reducing valve stuck - compressor valves worn or out of adjustment
Noisy Couplings	Misalignment - insufficient lubrication - worn
Motor Overloaded	High chilled water flow or temperature - suction damper open - too much refrigerant
Gear Overheated	Improper oil level - fouled oil cooler - not enough water to oil cooler - misalignment - loose coupling nut
Controls Not Operating Properly	Tampering - corrosion - control charge lost

The Operation Cycle

In the Carrier centrifugal refrigeration cycle, water or other liquid being chilled in the tubes of the cooler is chilled by transferring its heat to the cold liquid refrigerant. This causes the refrigerant to boil, and to change to a vapor. The vapor is drawn up into the suction of the compressor. The compressed vapor is forced up into the condenser where its temperature is higher than the water in the condenser tube. The vapor gives up its heat load to the condenser water, and changes to liquid again. The liquid refrigerant drains down to the cooler, and the cycle repeats.

At this point the centrifual refrigeration machine differs from the reciprocating cycle. Since the majority of centrifugal machines utilize two or more stages of compression (as opposed to normal single-stage reciprocating equipment), an important benefit is realized in the "economizer" cycle.

Staged For Economy

In this cycle the liquid refrigerant returning from the condenser to the cooler, enters a chamber between two float valves and connected by a gas passage to the suction of the second stage impeller. Here the pressure is about halfway between condenser and cooler, and a small part goes to the second stage impeller and is pumped back up to the condenser. Because this economizer gas is raised through only half the pressure range that the main volume of gas is pumped, power is saved.

Power saving can be as much as 6 per cent. Power can also be saved by adding tube surface but the same effect requires about one-third more tubes, with substantial increases in the weight of machine and contained water and refrigerant.

Where more than two stages of compression are used it is possible to use two stages of "economizer" action. Thus Fig. 1 shows two stages of economizer with a three stage compressor.

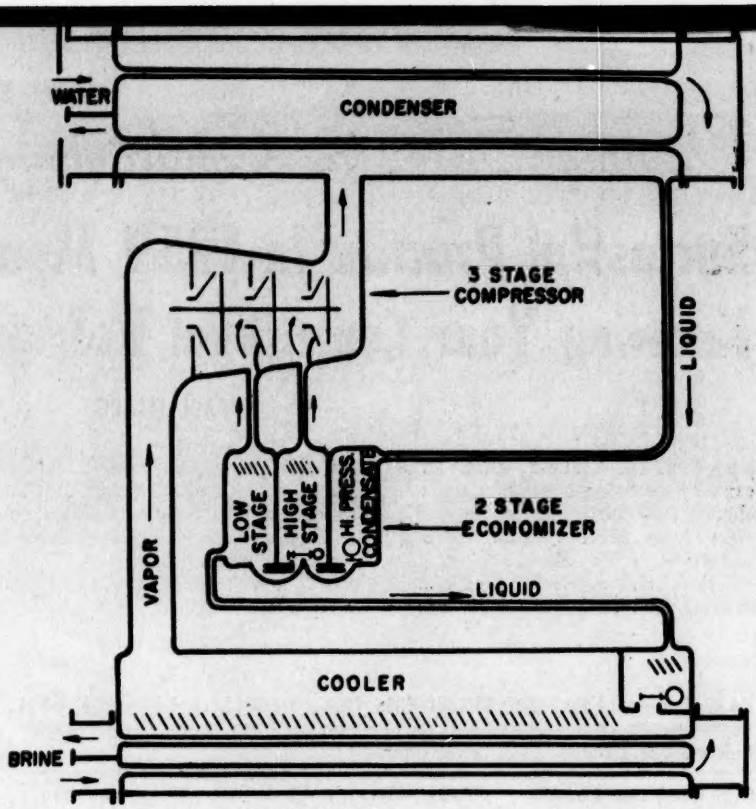


Fig. 1—Diagram of refrigerant cycle in the centrifugal compressor, water or brine chilling, refrigerant unit. Apparatus pictures a 2-stage economizer with a 3-stage compressor.

Capsule History of the Refrigeration Centrifugal

▶▶ CENTRIFUGAL refrigeration machines have probably done more to advance air conditioning and refrigeration industries than any other developments. Large capacity for producing chilled water, used to cool and dehumidify air, pried the lid from the biggest market for these industries — multi-story big building air conditioning. Eventually these machines were further developed into special refrigeration units producing temperatures as low as minus 125 F to chill brine, condense gases, and for other specialized applications.

The first machine, invented by Dr. Willis H. Carrier, was unveiled before some 300 refrigeration, power and construction engineers May 22, 1922. This machine, a 70-ton water chiller, was on duty at the Onondaga Pottery Co., Syracuse, New York until brought back to Carrier's manufacturing headquarters, also in Syracuse, July 1958.

Range in which centrifugal type units are commercially practical extends all the way from below 100 tons to above 3500 tons. The top figure is not a maximum capacity, but represents the largest machine required commercially to date. During 1957, 35th anniversary year of unit No. 1, its 4,000th successor was manufactured by the parent company. Today's largest units provide 50 times as much capacity while taking less than twice the space required by the original.

Current trend is toward higher capacities using higher pressure refrigerants. More dramatic advances are heralded for this type of equipment by a tiny compressor-turbine, the size of a football, which has a capacity of 15 tons. This "mighty-mite", together with its coils, weighs only 150 lbs. Two such systems will be used aboard Douglas Aircraft's DC-8 jet transports to provide cooling for air conditioning more than 130 passengers and crew. This centrifugal works well in an airplane, but more development work must be done before it can be practically applied anywhere else.

Major Components

The centrifugal refrigeration machine, (Fig. 2) consists of seven major components. They are: (1) cooler, (2) compressor, (3) condenser, (4) economizer (usually within the cooler). (5) purge, (6) drive and (7) controls. The purpose of each will be briefly described.

(1) **The cooler** is normally of the flooded, shell and tube type (Fig. 3). "Brine" (a general term applied to the substance being cooled) passes through finned or prime surface tubes made of copper, copper alloy or steel. They fill about half of the cylindrically-shaped container stretching the length of the pressure vessel.

Boiling refrigerant surrounds the outside of the tubes which are usually 3/4-in in diameter although other sizes are sometimes used. The tubes are expanded into holes in end plates, called tube sheets, providing a tight seal between the brine and refrigerant, while permitting relatively easy tube replacement.

To prevent liquid boiling over into the compressor, eliminators are placed just above the tubes. Without these eliminators any liquid passing through the compressor would lower capacity and increase hp.

Removable covers at each end permit inspection and cleaning of the tubes without disturbing the refrigerant. There is a similar cover on the refrigerant side of the cooler. A liquid level sight glass, refrigerant safety controls complete essential elements of the cooler.

(2) **The Compressor** consists principally of a cast iron or steel casing, rotor assembly, (Fig. 4) guide vanes and diffusers.

The casing holds diaphragms which separate areas of different pressures and provide gas passages between stages. Guide vanes direct gas into each wheel either with rotation or against rotation. These may be fixed or adjustable. The latter are sometimes furnished to provide a selective capacity range.

Journal bearings, to support the shaft; labyrinths to prevent leakage along the shaft; and thrust bearing shoes are other stationary parts.

Rotating Elements

The rotating elements consist of:

(a) a precisely machined, forged steel shaft on which lead coated impeller wheels or stages are mounted,

(b) an oil pump often driven by the main shaft through a worm and gear drive, which may also be located outside the compressor shell,

(c) balancing piston (normally used on high-pressure refrigerant machines) mounted on the shaft to reduce thrust bearing load, by applying a gas pressure in the opposite direction to the thrust pressure,

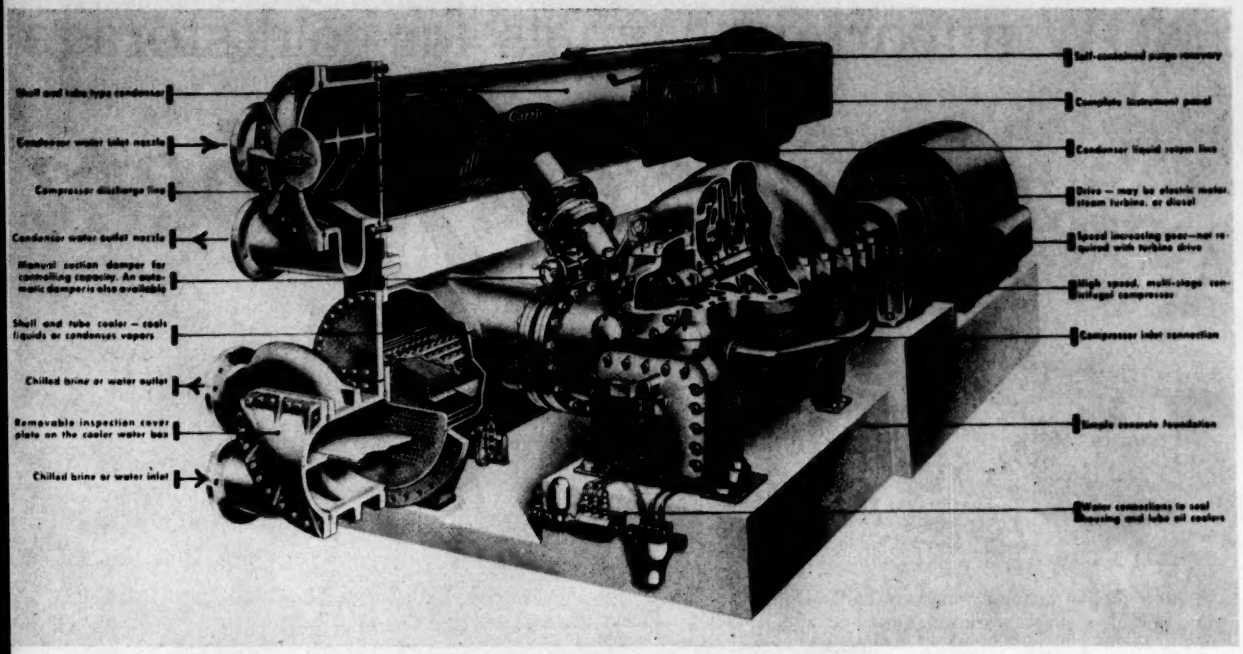


Fig. 2—Seven major components of the centrifugal refrigeration machine are shown by means of cut-away portions in this illustration. Text details the principal items.

(d) flexible coupling to connect the compressor with the drive or speed increasing gear.

Performance of any "centrifugal" as the refrigerating machine is referred to in the industry, is largely dependent upon its seals, which separate inner refrigerant pressure from the atmosphere. Two types of shaft seals developed by Carrier are typical of those used on all machines of this kind.

(a) **The bellows seal** (Fig. 5) is recommended where the suction operates under a vacuum, and the compressor is under a vacuum on shutdown. The seal is formed by a rotating ring fastened to the shaft and a stationary seat attached to the seal housing through a bellows.

These parts have highly polished metal surfaces which are held tightly together on shutdown by multi-leaf springs.

(Continued on Page 22)

Caution: Due to the high degree of surface finish on the bellows and contact seals, no attempt should be made to make repairs in this area without notifying the manufacturer or his representative.

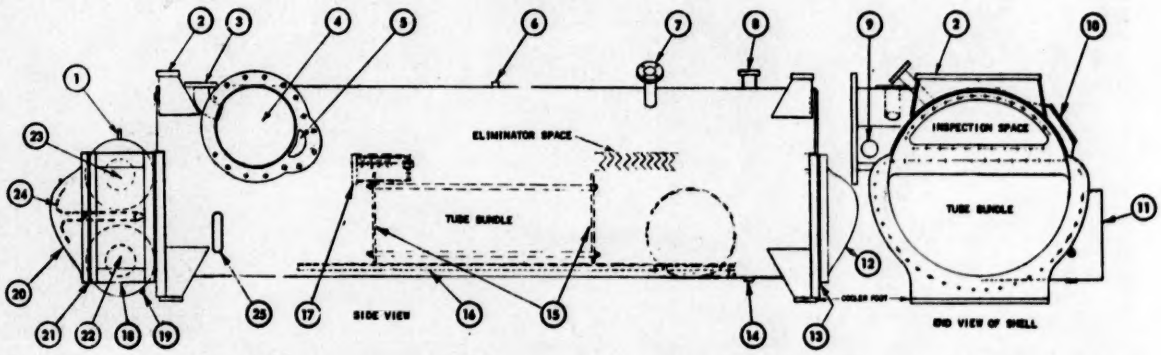


Fig. 3—Typical cooler hook-up with the centrifugal liquid chilling unit is pictured here with the plain end view of the shell. Numbered details follow:

1. Gauge and Vent Conn.
2. Condenser Support
3. By-Pass Conn.
4. Cooler Outlet
5. Low Stage Economizer Vapor to Compressor
6. Gauge Conn.
7. Condenser Relief Valve
8. Rupture Disc Conn.
9. High Stage Economizer Vapor to Compressor
10. Economizer Support
11. Economizer Liquid Chamber
12. Channel—Plain End
13. Water Box Gasket
14. Drain and Refrigerant Charging Valve Conn.
15. Support Sheets
16. Baffle
17. Thermometer Chamber
18. Channel—Nozzle End
19. Drain Conn.
20. Channel Cover
21. Channel Cover Gasket
22. Brine In
23. Brine Out
24. Division Plate
25. Refrigerant Sight Glass

NOW important savings for cold storage

New J-Foam

J-Foam is

Remarkably Lightweight!

A cubic foot of J-Foam weighs only one pound; a single workman can easily carry a dozen sheets at a time.

Large sheets are easily,

Quickly Installed...

operators with—

Insulation by Johns-Manville

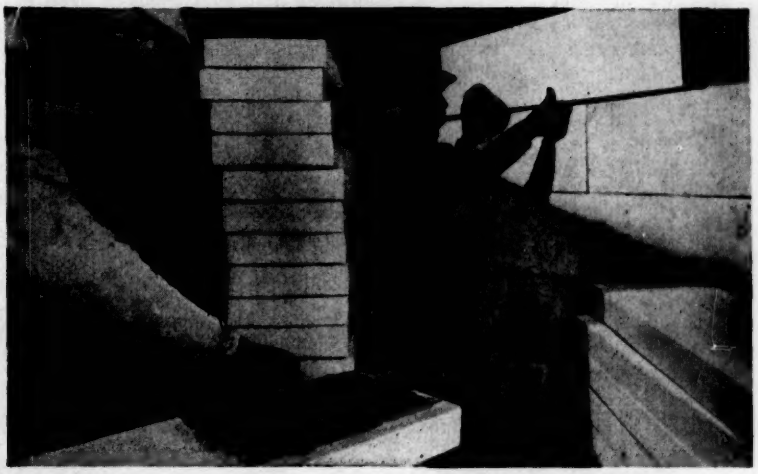
An improved, expanded polystyrene insulation . . . J-Foam reduces installed costs, assures long-term operating economy

COMPARE J-FOAM with other coldroom insulations and see the difference it makes in installation cost alone. See how easily it handles . . . how quickly it is installed . . . how well it can be applied to either wood or concrete construction.

After installation—savings go on year after year. For J-Foam's conductivity (Btu-in./hr/sq ft/F) is *extra low*, only .23 at 19F—.25 at 40F—.27 at 70F. And keeping conductivity always low is J-Foam's moisture-resistance; its water vapor permeability, for example, averages only 1.5 perm inches.

Let us send you the new J-Foam brochure, IN-209A. Write for it today. Address Johns-Manville, Box 14, New York 16, N. Y.

One man can easily place a sheet of J-Foam in position and hold it momentarily while adhesive grips. Lightweight . . . larger sheet sizes . . . ease of securing—all work to speed installation.



J-Foam Is Strong...

ideal for self-supporting partitions.

J-Foam's high strength and resilience solve many installation problems. It is ideal for self-supporting partitions . . . for walls, floors and ceilings of wood or concrete construction. J-Foam is also easy to cut; provides excellent surface for adhesive fastening.

See the informative new color motion picture —"Heat . . . the science and economics of its control." Ask your J-M representative.

JOHNS-MANVILLE

JOHNS-MANVILLE JM PRODUCTS

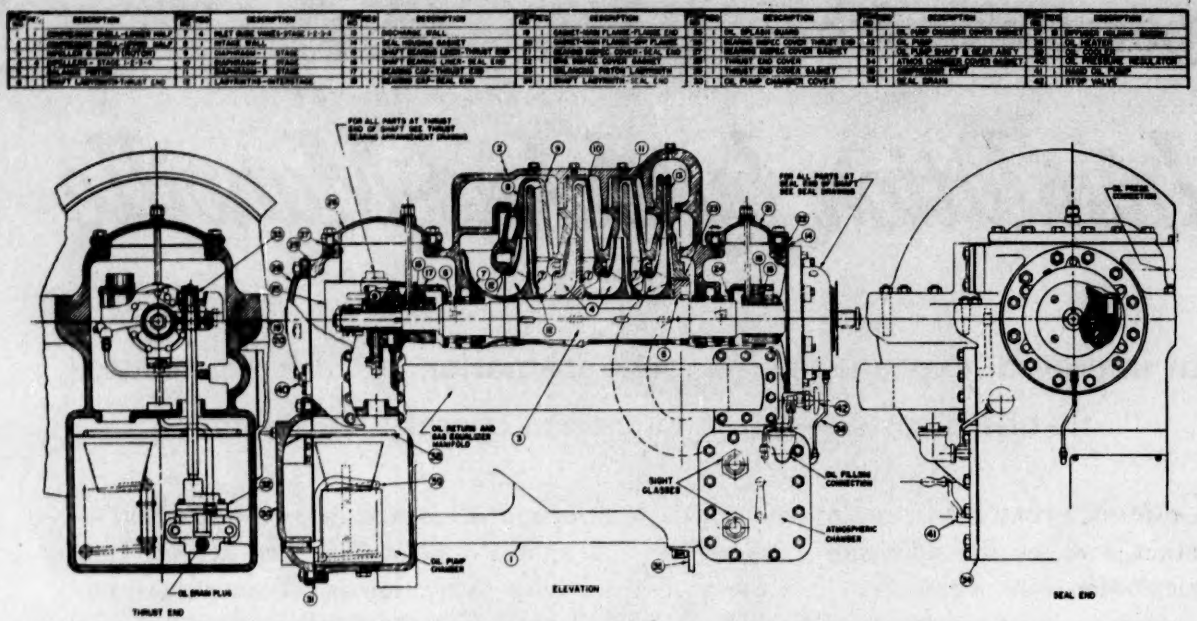


Fig. 4—Partial longitudal cross-section through a 4-stage, centrifugal compressor, with sections shown at the thrust and seal ends. This machine is equipped with a balancing piston to reduce thrust.

(Continued from Page 19)

On startup, the oil pressure expands the bellows, moving the stationary sealing seat against the pressure of the spring, and relaxing the pressure on the seal surfaces. Oil flows between the faces of this seat and the rotating seal ring. This positive supply of oil prevents leakage.

(b) **The floating carbon ring seal,** often called the contact seal, is mostly used for higher pressure refrigerant applications (Fig. 6). It consists of two special carbon rings held by springs against two highly polished surfaces of a ring which is fixed to the shaft. During shutdown, the inner carbon ring is held firmly against the contact ring by springs. During operation, the lubrication system maintains a pressure in the seal chamber which forces the inner carbon ring to move away from the contact ring. The outer carbon ring is free to rotate or float between the ring and contact sleeve so its rate of rotation is approximately one half the shaft speed. Cooling oil, supplied to the seal, removes friction heat.

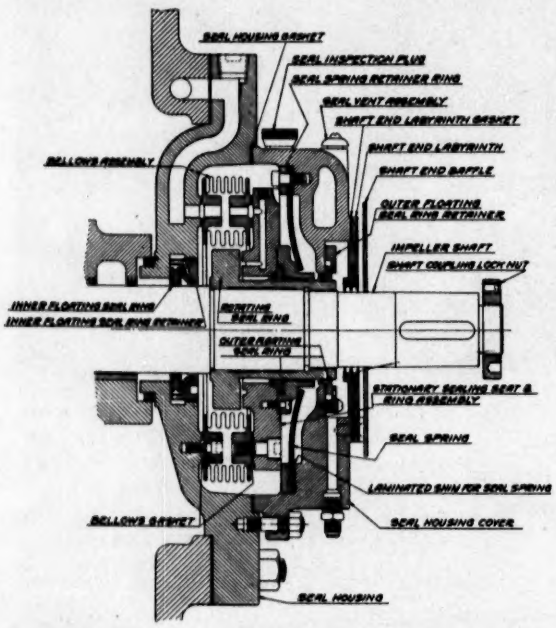


Fig. 5—This bellows type shaft seal is incorporated in centrifugals where suction pressure is less than atmospheric and the machine is under a vacuum on shutdown.

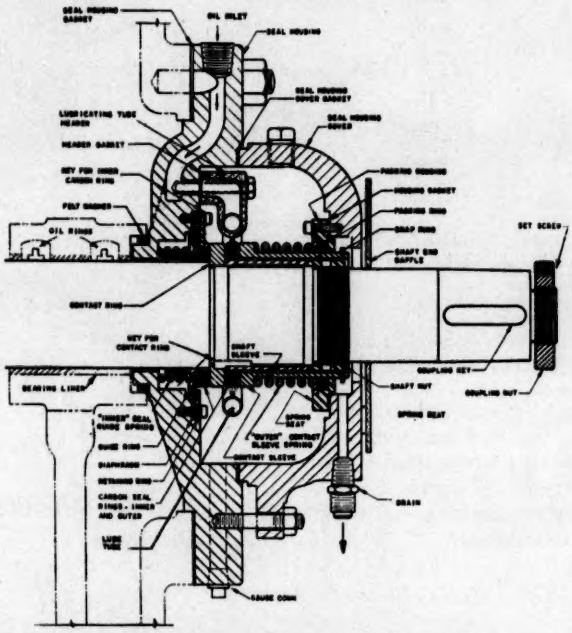


Fig. 6—Contact type shaft seal used for higher pressure refrigerants. Spiral springs retain the seal pieces in close contact during shutdown.

(3) **The Condenser** is usually of shell and tube construction (Fig. 7). Composition of the tubes depends upon the quality of the condenser water, but is usually copper. Water flows through the tubes. As in the cooler, the tubes are expanded into the tube sheets to provide a tight seal from the refrigerant side while permitting relative ease in removal and replacement. They should also be clean and free from scale for best results. Don't trust the eye when looking for scale—scrape the tubes to be sure they are clean. Chemical cleaning is often necessary.

If air should get into the condenser it can blanket the tubes, spoiling heat transfer and raising condenser pressure, reducing efficiency. Air can be kept out by purging. A baffle in the condenser forms a pocket to collect air, non-condensibles and water vapor, which is removed by the purge. If air leakage persists, a rigid leak detection program should be initiated to determine the cause and stop the trouble before it becomes a serious problem.

(4) **The Economizer** may be either a special external vessel with the required fittings or, more conventionally, it is built into one end of the cooler shell. Fig. 8 shows an external type while Fig. 9 illustrates the integral type.

This device is an important economy feature of the centrifugal refrigeration machine, hence the name "economizer". The number of economizer stages may vary from one (on a two-stage machine) up to several, but always one less than the number of compressor stages. Thus, it is possible to reduce the refrigerant from condenser to cooler temperature and pressure in three stages when a four stage compressor is utilized. This results in very significant power economy.

(5) **The Purge** is a device for removing undesirable gases from the system with a minimum loss of refrigerant. It should be regarded primarily as a device to indicate leaks in the machine. If air or water are continually being removed from the machine, the leaks should be repaired as soon as possible or corrosive substances will accumulate in the machine and eventually cause serious damage.

The purge should be run whenever the refrigerating machine is operating. Excessive purging warns of dangerous air and water leaks, thus saving large maintenance charges and helping also to insure high efficiency.

(Continued on Page 24)

FREEZING at −50°

or STORING at −10°

Refrigeration PAYS OFF!

Whether it's FAST FREEZING of fresh vegetables, fruits, meats or cooked foods...or sub-zero STORAGE, you get precise freezing control and safe protection for your products when you choose CP Refrigeration.

THE Creamery Package MFG. COMPANY
General and Export Offices:
1243 W. Washington Blvd., Chicago 7, Illinois
23 Factory Branches to Serve You Coast to Coast

CREAMERY PACKAGE MFG. CO. OF CANADA, LTD. 267 King St., West Toronto 2B, Ontario

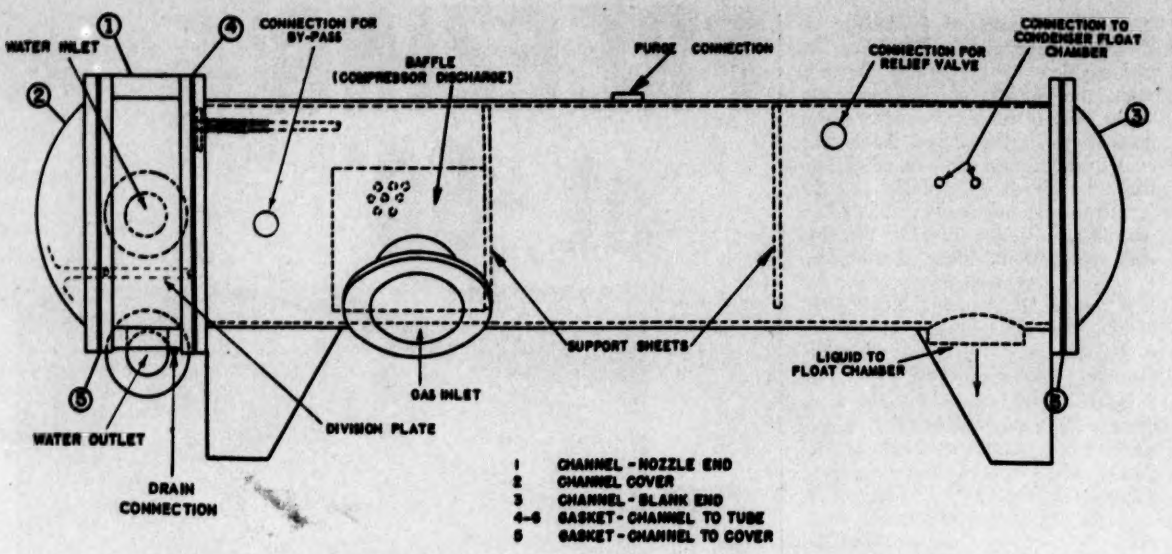


Fig. 7—Typical condenser used with the centrifugal machine is this 2-pass vessel.

Normally, a compressor draws a mixture of refrigerant and gases out of the cooler, compresses it and passes it on to the condenser where air and other non-condensibles remain as the refrigerant gas is liquefied.

As air accumulates in the purge under pressure it opens a relief valve venting itself and a small quantity of refrigerant to the atmosphere. This type of purge is illustrated in Fig. 10. Any water present in the system or condensed out of the air floats on the refrigerant, and a sight glass indicates the level of water and refrigerant in a separation chamber. Such water is bled to the atmosphere by a hand valve. The refrigerant is automatically returned to the cooler. A record of the amount of water removed should be kept to enable detection of water leakage into the refrigerant from any tube leak in cooler or condenser.

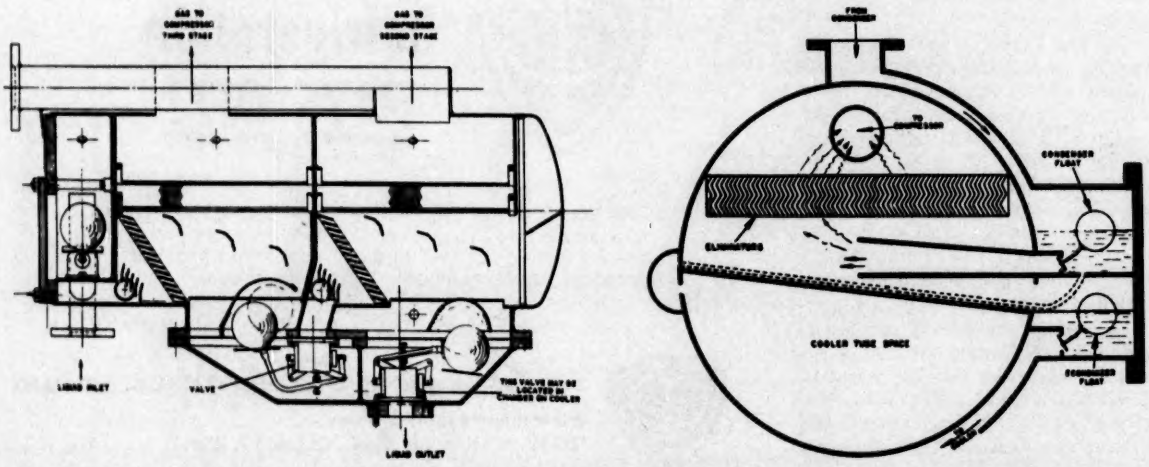
A new type of purge (Fig. 11) developed by Carrier for use with high pressure refrigerants does not need a compressor. Purged gases are merely passed into a chamber and cooled by a coil through which liquid refrigerant has been expanded. Water and refrigerant are condensed, separated and evacuated. Air is relieved by a solenoid valve which is actuated by a differential pressure switch. This switch closes when air pressure builds up and approaches the pressure of the condenser.

(6) **The Drive** is usually an electric motor with a speed increasing gear, or a steam turbine. Gas turbines are used in some cases. Diesel and gas engines may be used, under certain conditions.

Turbines are ideal drives since they do not require a speed increasing gear, permit capacity control by varying speed and can be selected to operate under most economical conditions in conjunction with other plant steam apparatus.

Synchronous motors may give a power factor improvement but normally require an automatic suction damper for capacity control.

Squirrel cage motors are probably the most popular electric drive. They



Figs. 8 and 9—Illustrate the two types of economizers used with centrifugal condensing units. Fig. 8, left, pictures a 2-stage economizer in a sectional view. Fig. 9, at right is the cross section sketch of an economizer built integral with the cooler.

too, usually require an automatic suction damper for capacity control.

Slip ring motors are often used to vary speed and thus obtain different capacities.

(7) **Controls** are a vital but often neglected part of the centrifugal machine. They serve two functions—safety and capacity regulation. Thermometers and pressure gauges indicate conditions at the bearings, oil supply lines, cooler, condenser and purge. They only indicate trouble, if it occurs. Safety controls shut the machine down protecting it against low oil pressure, high condensing pressure, low refrigerant temperature, low brine temperature and sometimes high bearing temperatures.

Capacity controls vary the compressor speed, throttle the compressor guide vane setting, by-pass gas from condenser to cooler, or increase the condenser pressure. These are different ways for achieving capacity regulation. The most efficient method for controlling capacity is through varying speed of the rotor. Throttling compressor suction and changing the inlet guide vane setting provide similar results, and are both good. By-passing gas from the condenser to the cooler is less desirable and throttling condenser water to raise condenser pressure, is least effective.

Check controls frequently to be sure they are in good operating condition. All thermometers and pressure gauges should also be tested to be sure they are giving correct readings. A machine is often reported to be malfunctioning, when actually the controls are not properly set or thermometers and pressure gauges are not sensing accurately.

Easily Adaptable

Though these machines are usually assembled in the same arrangement, to meet special requirements of industry, they are adaptable to other configurations for efficient performance. While this description is for the "open" type of unit, much of the material is applicable to the hermetic type of machine. The primary difference is the absence of the external shaft seal on the hermetic unit.

Charging With Refrigerant

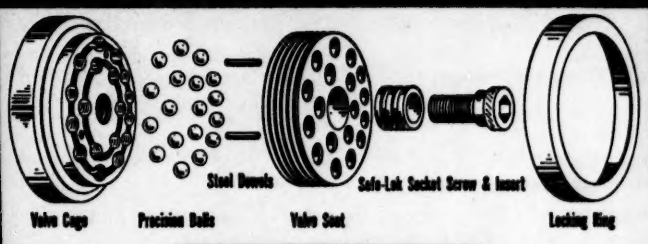
The quantity of refrigerant required is customarily specified by the equipment manufacturer. Remember that, in the flooded type of cooler, the refrigerant level on shutdown should not submerge all the tubes. When the machine is placed in operation, the refrigerant boils and covers the remaining tubes with foam thus making all heat transfer surfaces effective. Eliminators of various designs prevent liquid from being drawn into the compressor with the evaporated refrigerant. If too much refrigerant is added, liquid may enter the compressor by flooding the eliminators thereby increasing drive horsepower required and reducing capacity. The correct charge is normally about two-thirds of the height of the tube bundle at shutdown.

To determine a correct charge add refrigerant until the difference between leaving brine and cooler temperatures is at a minimum. Do not be concerned by the indicated level during operation if the unit is functioning properly. When the machine is running the sight glass gives erratic readings on occasions.

The machine should be checked periodially to see that there is no deviation from the normal operating temperatures, i.e., the difference between the leaving "brine" temperature and cooler refrigerant temperature will increase if the charge is not sufficient. Refrigerant should be added to reduce this leaving difference if a change in level is noted.

(Continued on Page 27)

You Can See The Difference!!!



BALL VALVE

TOTALLY UNLIKE ANY OTHER VALVE

Will Increase Performance of *ANY* Compressor!

For: Y-6½ x 6½

For: Old Style 9 x 9

For: Old Style 12 x 12

- 26% to 80% More Gas Passage
- Less Resistance
- Standardized Assemblies for Most Compressors
- Easy to Install
- Better Seating—Longer Life
- Eliminates Valve Failure or Breakage
- Discharge and Suction Valves in Stock for More Than 100 Different Compressors
- Immediate Shipment

For information on improving performance of your compressors, send us the name, bore, stroke, speed and serial number of each machine.

BALL VALVE COMPANY

5512 OAK STREET • KANSAS CITY, MO.

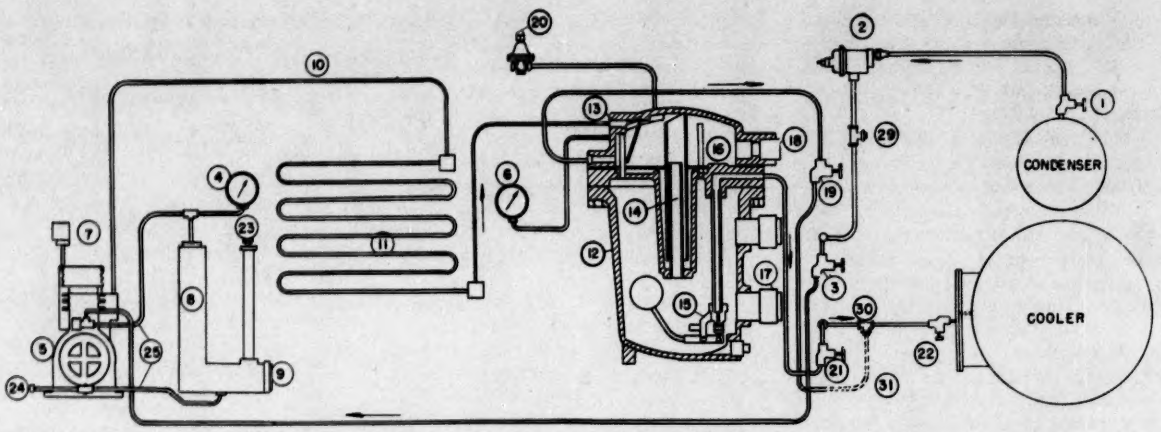


Fig. 10—Purge unit for the centrifugal condensing-cooling apparatus has in the past generally employed a separate small compressor and air condenser of its own, as pictured in the schematic above. Non-condensables and refrigerant vapor are removed from the condenser, compressed, condensed and separated in the evacuator chamber. Refrigerant returns to the cooler, non-condensables are purged to the atmosphere and water is drained off by hand.

1. Stop valve
2. Pressure reducing valve
3. Stop valve
4. Suction pressure gauge
5. Compressor
6. Discharge pressure gauge
7. High pressure cutout switch
8. Auxiliary oil reservoir
9. Sight glass
10. Compressor discharge line
11. Condenser—air cooled
12. Evacuator chamber
13. Condenser drain line
14. Weir and trap
15. Float valve
16. Equalizer tube
17. Sight glass—refrigerant
18. Sight glass—water
19. Stop valve
20. Automatic relief valve—air
21. Stop valve
22. Stop valve
23. Oil fill plug
24. Oil drain
25. Aux oil reservoir connections
29. Plugged tee
30. Plugged tee
31. Temporary connector pipe

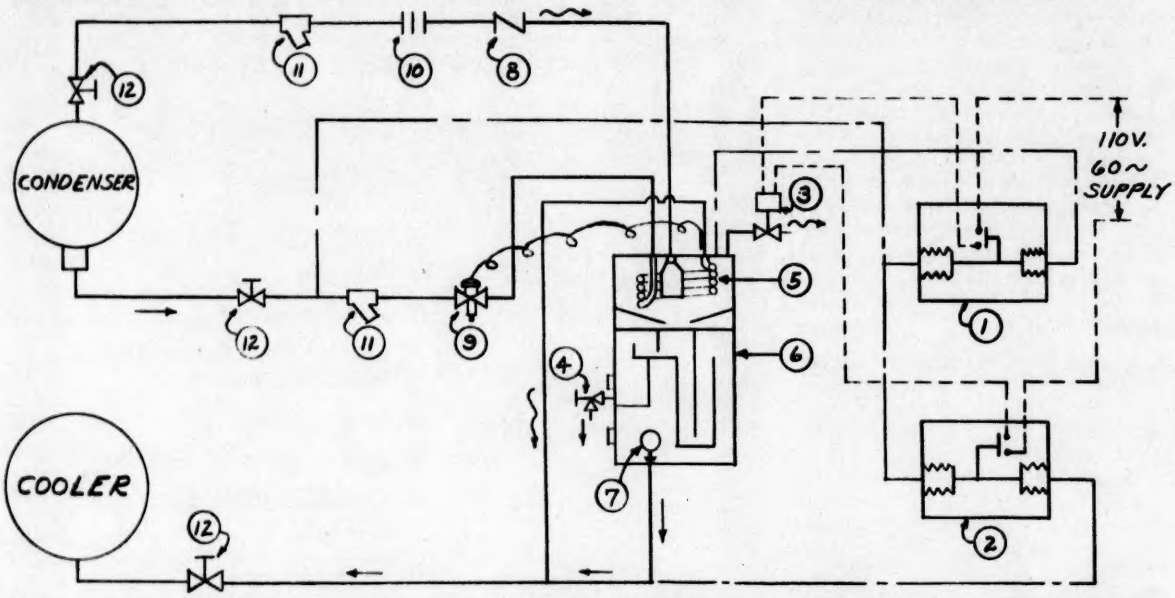


Fig. 11—Schematic purge cycle diagram showing a new thermal type purge which eliminates the separate compressor and condenser pictured in Fig. 10. Symbols of liquid and gas flow, control pressure and electrical wiring are shown at right.

In place of the evacuator chamber, this purger uses a separation chamber equipped with a refrigerant coil. Expansion of refrigerant in the coil condenses water and refrigerant vapors which are drained off and non-condensables are purged by pressurestat solenoid valve.

1. Differential Pressurestat
2. Differential Pressurestat
3. Normally Closed Solenoid Air-Relief Valve
4. Water Drain Valve
5. Cooling Coil
6. Separation Chamber
7. Purge Float Valve
8. Check Valve
9. Automatic Expansion Valve
10. Orifice
11. Strainers
12. Shut Off Valves

SYMBOLS

LIQUID FLOW
GAS FLOW
CONTROL PRESSURE LINE
WIRING

(Continued From Page 25)

It goes without saying, if one or more units are operating in the same plant, but with different refrigerants, care should be taken to see that the correct refrigerant is put into each machine.

Specific details for starting and stopping should be obtained from the manufacturer. However, here are general instructions covering most any motor driven refrigeration units on air conditioning duty.

1. Check oil levels
2. Start the purge
3. Start condenser water flowing
4. Start "brine" circulating
5. Check the control air supply
6. Close the suction damper as much as necessary to start the machine – open when the ma-machine reaches speed.
7. Close the holding circuit for the safety controls by holding in the button on motor panel.
8. Bring machine up to speed, observing the oil pressure. If pressure does not develop in approximately 10 seconds, stop the machine and re-start.
9. Adjust the oil cooler water flow to give normal bearing temperatures (usually under 180 F).

Trouble Shooting

Table I lists some troubles that may occur and their cause. For more serious problems, the manufacturer's service representative should be consulted.

The key to success in operating and maintaining a centrifugal refrigerating machine is to understand **how** it operates and **why**. To help practical engineers do this, manufacturers issue operating and service instructions and customarily provide a period of instruction. Service representatives of the manufacturer are there to help plant operators with any questions or problems they may have concerning the equipment. These people are interested in working themselves out of a job to see troublefree operation of equipment.

The Author is a Service Engineer in the Service Engineering Department, Carrier Corp. The article was written at the request of Frank L. Chase, Educational Director, NAPRE. Chase, Past President, NAPRE, is building superintendent and chief engineer of the Hibernia Bank Building, New Orleans, a skyscraper office building landmark.

Lease Air Conditioning

▶▶PACKAGE equipment leasing has now reached the refrigeration and air conditioning industry. A Chicago firm announced recently (see page 4 March '59 INDUSTRIAL REFRIGERATION that any combination of equipment might be considered one package and leased as a unit from three to five years. The plan would permit commercial and industrial firms to acquire ten's of thousands of dollars in air conditioning equipment for comfort or process air conditioning, without capital investment.

The announcement came from Nationwide Leasing Company, and according to Robert Sheridan, president, the plan was developed to meet the need of expanding production firms to add to or modernize their facilities without depleting liquid working capital. Examples of leases given with the announcement were along the following lines: Lease equipment worth $10,000 for three years for a monthly payment of $320.00; a $25,000 lease would cost $800.00 monthly on a 3-year contract, $625.-00 monthly on a 4-year arrangement; leases over $50,000.00 feature three, four, five year terms with monthly costs of $1600.00, $1250.00 and $1050.00 respectively. (Chart outlining package lease plan is available).

GET ACCURATE FLOODED SYSTEMS CONTROL

with this level regulator

A SIMPLE CONTROL IS THE BEST CONTROL

PHILLIPS FLOAT CONTROLS

- Proportioning action for smooth feed at all capacities
- Tight Closing with Teflon seat discs
- Self actuation—no electrical or pneumatic connections needed
- Visible liquid level through exclusive "Level Eyes"
- Adjustable level achieves maximum capacity with minimum charge

IN ADDITION — Phillips pilot operated valves are available for all common refrigerants, down to —50° F. Operates with as low as 2 PSI pressure drop and up to 250 PSI with selected springs. Line sizes ½ inch to 4 inches with steel or copper connections.

Solve your flooded system design and application jobs by consulting Phillips. Our firm of engineers have specialized in level control, liquid-vapor separation, liquid circulation and return systems for over 28 years.

H. A. PHILLIPS & CO.
Designers and Engineers
Refrigeration Control Systems
3255 W. Carroll Ave.
Chicago 24, Illinois

York Cavalcade Rolls Westward

▶▶GREATEST GROWTH FIELD is the terse description applied by R. C. Ingersoll, Chairman of Borg-Warner Corp., to the refrigeration and air conditioning industry, when he addressed York Div. Associates, dealers, architects, engineers, contractors, building superintendents and chief engineers at the York Cavalcade of Products displayed at the Coliseum in Chicago, Thursday, March 12. Introduced to the attendants by Henry M. Haase, President, York Div. of B-W, Ingersoll told those present that after two years of experience Borg-Warner officers were convinced that they were right to get into the refrigeration field through the York door.

Ingersoll related how the Cavalcade of Products, now making a cross-country tour that will involve some 40,000 miles of travel, got started as a result of requests at the Heating, Air Conditioning and Ventilating Show in Philadelphia in January 1959. The Cavalcade started off its one-day exposition in major cities of the United States, at the Coliseum of New York on February 17 and will end up in Boston on May 5. Intermediate stops with the two specially constructed semi-trailers have been Pittsburgh, Cincinnati, Cleveland, Detroit and Chicago. Following the Chicago appearance the schedule calls for stops at St. Louis, Kansas City, Phoenix, Los Angeles, San Francisco, Dallas, Houston, Atlanta, Washington, D.C. and Boston.

Prompted by Market Research

Of interest to the industry were remarks by Ingersoll concerning surveys that Borg-Warner made before deciding to get into the heavier refrigeration and air conditioning fields. He stated that surveys by the Corp's Research Division had indicated the appliance market had reached about 85 percent saturation. This included laundry equipment as well as domestic refrigeration equipment, except domestic air conditioning.

Investigations showed further that there was about two percent saturation in the residential air conditioning field, and only eight percent saturation of comfort and process air conditioning among building and commercial prospects. Ingersoll concluded his Chicago remarks with the statement that York Div., Borg-Warner, is determined to make the greatest contribution to the refrigerating and air conditioning field, in the interest of the welfare of this country.

Personnel Introductions

Austin Rising, Vice-President and Director of Marketing for York, was program chairman for the Chicago presentation of the Cavalcade. In addition to Haase and R. C. Ingersoll, he introduced R. S. Ingersoll, president, Robert Murphy, vice-president and counsel, and Don Sutton, director of advertising and public relations, all of Borg-Warner Corp. Also introduced from the floor and credited with inspirational ideas in connection with equipment design and application, was Mel Boldt of Mel Boldt & Associates, Industrial Designers, Chicago.

Introduce 18 New Products

The program included the introduction of heat pumps, Hi-I units, packaged products, lithium bromide absorption system, Hydraline equipment, V/W hermetics, and Turbopaks. The presentation of each line (18 in all) was handled by an officer or leading sales figures with York Div. Their remarks were not only augmented by the Cavalcade displays, but a slide film was projected on a screen which added to the presentation.

Heat pump emphasis was on air source types. It was indicated that units were available from York in three general classifications—packaged, factory, assembled and custom built—giving a great flexibility in the choice of units for residential, commercial and industrial application.

Hi-I units are York's approach to the distribution of air for comfort air conditioning in hotels, offices and institutions where there are a great number of cubicles and occupancy of widely varied preferance in temperature demands. The new distribution unit is a 3-pipe affair with two coils and a special valve for admitting hot or cold water on demand; and a means of introducing forced primary air, with an induced secondary air movement in the space itself.

Refrigeration Talks For Mechanical Contractors

▶▶TWO OF FOUR featured panel discussions at the Mechanical Contractor's Association of America, Inc. Seventieth Anniversary Convention at the Sherman Hotel, Washington, D. C. April 28 to May 1, will feature refrigeration and air conditioning. Two more speakers will discuss important developments on the absorption type central refrigeration plant and the heat pump. Still another paper on noise control in mechanical equipment will have emphasis for the air conditioning engineer. Seventieth session will be called to order in the nation's capitol by Horace E. Wetzell, president.

Trane Diversifies

▶▶INVESTMENT ANALYSTS, Chicago, were told on March 12 that the Trane Co., LaCrosse, Wisc., will diversify further in 1959 in their heat exchange equipment. The Company plans to introduce new products late this year which will include schoolroom ventilators with provision for cooling; new absorption machines employing chemical refrigeration, for large building air conditioning applications; and, other products not only for cooling buildings, but for food preservation and temperature control in industrial processes, as well.

Refrigerated Transportation

Shopping Center Meet

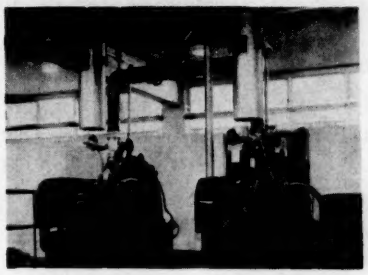
▶▶SHOPPING center construction, a tremendous boom during recent years, has again taken an upswing in recent months, according to Leonard L. Farber, President, International Council of Shopping Centers. That is what he will tell at the Third Annual Convention of the Council, when it meets in Chicago, April 6 to 9. In nearly every area of the country, suburban branches are outstripping downtown headquarters stores in steadily climbing sales, said Mr. Farber in an advance release announcing the meeting. The International Council of Shopping Centers is a trade association of developers, owners and managers, said to represent about one-fourth of the North American shopping centers which is estimated at approximately 2800 firms.

AIRO Represents York

▶▶AUTHORIZED wholesale distributor of York Flex-O-Metic condensing units for the greater Chicago area is AIRO Supply Company, Inc. Announcement of the appointment indicated that the wholesaler's territory included Cook, DuPage and Lake Counties in Illinois, and Lake and Porter Counties in Indiana.

Mountain-top Skating Rink in South America

Pico Avila is the mountain-top skating rink designed and installation supervised by personnel of Creamery Package Mfg. Company, Chicago.

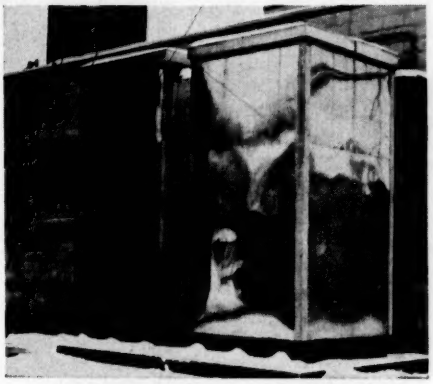


Above, the CP multi-cylinder compressors used for maintaining rink temperatures at Caracas, Venezuela.

Food Firm Control Goes To Grower

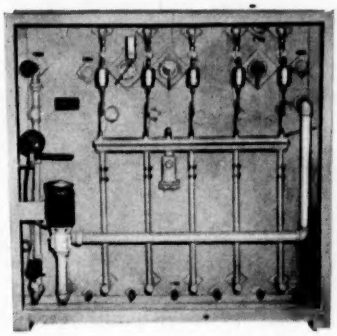
▶▶CONTROLLING interest in S & W Fine Foods was acquired by Di Giorgio Fruit Corp. in February, it was announced jointly by the fruit firm's board chairman and the president of United Vintners, Inc. The latter firm had holdings of almost half of the S & W stock. UNITED PRESS INTERNATIONAL estimated the total sale at $6 million dollars. J. S. Di Giorgio is chairman of the board, of the Di Giorgio Corporation.

Now! "King Zeero" offers Pure Filtered Cold Water for Ingredient and Wash Water Applications



(AT RIGHT)

Front View of New PURE WATER COOLER (PATENTS PENDING)



(AT LEFT)

View of "King Zeero" E series Ice Builder installed outside of the Pet Milk Company plant at Evart, Michigan.

THE "KING ZEERO" ICE BUILDER

with stored ice and direct expansion provides 32°-34° circulating water for all product cooling needs.

Maximum Economy in Operation and Maintenance.

The sales representatives of the leading lines of dairy and refrigeration equipment who call on you will be glad to discuss details with you.

For many years the "KING ZEERO" Ice Builder has been accepted equipment in the dairy industry all over the world for the quick cooling of milk and dairy products.

Now after 10 years of testing and experimentation, "King Zeero" has perfected a unit providing charcoal filtered pure cold water for butter and cheese wash, cooling of dressed poultry, and ingredient water for bakeries, carbonated beverages, etc., as shown at the recent Dairy Exposition in Chicago.

It embodies all the outstanding features of "KING ZEERO'S" standard Ice Builders--non-mechanical agitation with patented built-in louvers, lower power demand, operating and maintenance costs.

THE KING ZEERO COMPANY

4300-14 W. Montrose Ave.
Chicago 41, Ill.

Manufacturers of Ice Builders - Ice Builder Cabinets - Ice Banks Pure Water Coolers

Industry Meetings

There's a Place in Your Planning For Kohlenberger Engineering

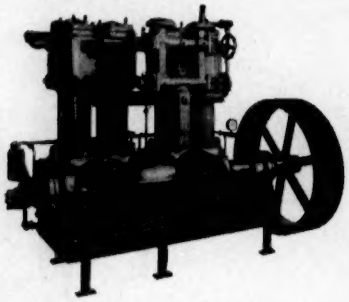
Kohlenberger's extensive manufacturing facilities and experienced staff make it possible to offer industry a *complete* service in the development and installation of heavy duty industrial refrigeration and air conditioning equipment.

For 36 years Kohlenberger Engineering Corporation has built its reputation on the dependability and quality of its equipment and the skill and integrity of its engineering staff.

Kohlenberger services include:

Equipment Manufacture
Refrigeration System Design
Plant Layout
Field Erection

When quality and dependability count . . . contact Kohlenberger!



Kohlenberger 100 H. P. heavy duty industrial VSA ammonia or freon compressor. Other models available.

Write for free illustrated brochure.

KOHLENBERGER ENGINEERING CORPORATION

1610 Commonwealth Avenue, Fullerton, California

Refrigerated Transportation

Frozen Food Piggy-Back From Maine To New York

▶▶SPECIFICALLY TAILORED to railroad needs, six cars for piggy-backing insulated trailers loaded with frozen foods, were delivered to the Bangor and Aroostook Railroad in February. First shipments on the equipment left Caribou on February 27 for New York City carrying frozen French fried potatoes from Birdseye Div., General Foods, destined for metropolitan New York City distributors.

Officials of Birdseye and the BAR were on hand to watch the unloading of the cars. According to the Birdseye officials this was the first frozen food piggy-back shipment in regular service over a regular route East of the Mississippi. Many off-rail customers want smaller lots than is possible in carload shipping, according to Howard L. Cousins, Jr., Director of Marketing and Public Relations for the railroad. Refrigerated piggy-back permits the railroad to offer the same services as highway competition, but with all rail advantages.

Cousins credited Birdseye with an important part in this development on BAR. Trailers transported on the special cars, are tailored to cope with clearance of railroad tunnels and bridges. Each railroad unit is equipped with a ThermoKing refrigeration plant which furnishes either heat or cold to the insulated trailer as the cargo requires. The shipment was made over BAR, Maine Central and the Boston and Maine right-of-ways.

Pacific Intermountain Adds To Reefer Fleet

▶▶DELIVERY was taken on $1½-million dollars worth of new ultra-modern line-haul equipment by the Pacific Intermountain Express Co. earlier this year. The move was in anticipation of rapid upturning business and broad industrial expansion in the West, according to A. S. Glikbarg, president. Sleeper cab service was introduced to better the transcontinental route and reduce transit time on Midwest-Pacific schedules.

Irregular service for the handling of frozen goods was established following approval by the ICC. To provide the best service possible, PIE added two-way radios in the city pick-up fleets and has leased teletype wires to terminals on the line to alert them on departure and arrival time for each rig in the new refrigerated service, said the JOURNAL OF COMMERCE.

Another Food Producer Operates Own Fleet

▶▶HIGHLIGHT of a recent story on the Vincent Syrup Co., Denver, was the refrigerated truck fleet used to facilitate salad and other food product deliveries. Although the firm is completing a $60,000 addition to its food processing plant, that story played second fiddle to the long distance refrigerated fleet. The firm recently extended sales territory into Kansas and Missouri from Denver, featuring its Bar-None salad in addition to its long established Vincent and Bar-None syrup brands. The salad line was introduced only three years ago and is sold in refrigerated cases in retail stores, hence the necessity for refrigerated processing, refrigerated storage, and refrigerated trucking.

Refrigerated Meat From Australia to America

▶▶LARGER AND FASTER refrigerated cargo ships are being placed on trade routes between Australia and North America to meet the demand for Australian meat imports into the U.S. and Canada, according to the CANADIAN COMMERCIAL COUNSELLOR at Melbourne. Four refrigerated ships carried meat cargoes to North America in the first two months of 1959 and four additional ships were scheduled to leave Australian ports, March through May. American trade publications and newspapers, in March, carried reports on the arrival of the first shipment in West Coast Ports. West Coast packers and purveyors gave no indication as yet to the effect of this import on the price of domestic beef and lamb.

Refrigerated Bridge

▶▶TRANSPORTATION utilizes refrigeration in more ways than comfort cooling for passengers and protection of perishables. ENGINEERING NEWS-RECORD reported recently how refrigeration was used to keep an existing ice build-up on a river at three foot thickness, thus providing a bridge for gravel trucks. The gravel company had been refused permission to build a temporary wooden bridge over the river and thus cut four miles off its haul route. Nearly a mile of plastic pipe was laid in the river and refrigerant pumped through it to sustain a natural ice build-up and provide a bridge or routeway of ice.

Industry Meetings

Refrigeration Research — **Apr. 2-5**
THE REFRIGERATION RESEARCH FOUNDATION
Statler-Hilton, Washington, D.C.

Refrigerated Warehousing — **Apr. 5-9**
NATIONAL ASSOCIATION OF REFRIGERATED WAREHOUSES
Statler-Hilton, Washington, D.C.

Shopping Center Meet — **Apr. 6-9**
INTERNATIONAL COUNCIL OF SHOPPING CENTERS
Palmer House, Chicago

Welding Exhibit and Convention — **Apr. 7-10**
INTERNATIONAL DISPLAY
International Amphitheatre, Chicago
AMERICAN WELDING SOCIETY
Sherman Hotel, Chicago

Mile High Ice Making — **April 9-11**
MOUNTAIN STATES CONVENTION
Broadmoor Hotel, Colorado Springs

Meat Packing — **Apr. 16-19**
NATIONAL INDEPENDENT MEAT PACKERS ASSN.
Palmer House, Chicago

Old Dominion Ice Meet — **April 21-22**
VIRGINIA ICE CONVENTION
Chamberlin Hotel, Old Point Comfort, Va.

Environmental — **April 22-24**
INSTITUTE OF ENVIRONMENTAL ENGINEERS
LaSalle Hotel, Chicago, Ill.

Practical Refrigeration Engineers — **Apr. 25**
NORTHWEST REGIONAL CONFERENCE, NAPRE
Olympic Brewing Co., Olympia, Wash.

Mechanical Contracting — **Apr. 28-May 1**
MECHANICAL CONTRACTORS ASSN. OF AMERICA
Shoreham Hotel, Washington, D.C.

More Practical Engineers — **May 1-2**
CALIFORNIA REGIONAL CONFERENCE, NAPRE
Mayfair Hotel, Los Angeles

Air Cond'g & Refrig'n — **May 3-6**
AIR-CONDITIONING AND REFRIGERATION INSTITUTE
The Homestead, Hot Springs, Va.

Fire Protection — **May 25-29**
NATIONAL FIRE PROTECTION ASSN.
Atlantic City, N.J.

Materials Testing — **Jun. 21-26**
AMERICAN SOCIETY FOR TESTING MATERIALS
Chalfonte-Haddon Hall, Atlantic City, N.J.

Refrig'n & Air Cond'g. — **Jun. 22-24**
AMERICAN SOCIETY OF HEATING, REFRIGERATING & AIR CONDITIONING ENGINEERS
Lake Placid Club, Lake Placid, N.Y.

International Refrigeration — **Aug. 19-26**
TENTH INTERNATIONAL CONGRESS OF REFRIGERATION
Copenhagen, Denmark

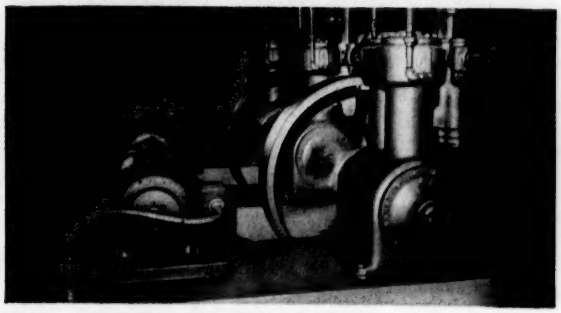
Meat Packing — **Sept. 25-29**
AMERICAN MEAT INSTITUTE
Palmer House, Chicago

Air-Cond'g & Refrig'n Exposition — **Nov. 2-5**
11TH EXPOSITION OF THE AIR-CONDITIONING AND REFRIGERATION INDUSTRY
Convention Hall, Atlantic City, N.J.

when you buy equipment from
HOWE

Today, refrigeration costs are figured on an over-all basis. Even in your early planning, Howe engineers' 47 years of specialized experience can save you time and dollars in the design and installation of new systems or replacements. Howe equipment meets exact refrigeration standards, is correctly engineered to your individual plant. Hundreds of Howe installations attest to Howe's ability to lower costs *every step of the way*. In planning, in low first cost, in installation, in long efficient operation—"*it pays* to know Howe!" Consult us now!

HOWE Model G — 5 to 25 Tons. Others to 150 Tons



HOWE
ICE MACHINE CO.
2829 Montrose Avenue • Chicago 18, Illinois
Distributors in Principal Cities • Cable Address: HIMCO, Chicago

NAPRE QUESTION BOX

H. P. Hayes

HAVE A QUESTION? Address it to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif. Answers appear monthly in this department on problems forwarded by NAPRE members. Comments from all readers welcomed.

More On PURGING

Correct Removal Point

QUESTION: When an automatic purger is used, is a purge connection from both the receiver and the condenser required? Or is the purge connection from the receiver only sufficient?

The following conditions are applicable:

(1) Only one condenser and one receiver are involved.

(2) The condenser is evaporative in one installation; shell and tube conatmospheric cooling tower, in another.

—T.H.R., Three Rivers

—D.D.W., Los Angeles

ANSWER No. 4: Considering the January 1959 INDUSTRIAL REFRIGERATION presentation of the proper location for a purge point, manual or automatic, one must stop, step back and look at all of the various ideas and principles. Then it is very easy to say just why there are so many ideas on where to locate the purge point.

Basically, the practical engineer must remember that if any two or three different gases are mixed, the natural law is for each gas to occupy the volume available. The total pressure in the container will be equal to the sum of each individual gas pressure (partial pressure) occupying the same volume (each single gas has a partial pressure which is part of the total pressure).

Now, the engineer should also remember that the lower the temperature, the higher density for a particular gas. That is, one cubic foot of any gas will weigh more at say 60 F than one cubic foot of gas at 120 F.

Also, remember that there are piping connections between the various components of any refrigeration system as condenser, receiver, evaporator, etc. These pipe lines offer a pressure drop between the components. The sometimes slight pressure difference due to non-condensible gas, bottles up the non-condensible gas in one or more of the components. So, if we consider temperature, pressure, (partial and total) piping, and system configuration we can select the ideal purge point for any system at any condition of operation.

Purge Point

The old purge methods are explained logically today but not by the idea that "air is heavier, therefore purge from the receiver." This was satisfactory, but not if the receiver was much warmer than the condenser. Usually the density of the non-condensibles was greater in the receiver and purging was satisfactory due to the lower temperature in the receiver than in the condenser. Also, the receiver was vented to the condenser and the liquid line was large enough so that actually the slight partial pressure of the non-condensibles could be really equalized and given a boost by the lower temperature in the receiver.

Also, if multiple condensers are used as on page 35 of the January issue and a large equalizing line is used, then it is possible to purge from a point in the receiver—generally any point because usually the temperature is constant throughout the shell.

Today, all that we have to remember in order to purge most efficiently is: the pressure (partial and total), temperature, configuration and piping of the system.—**R. E. Z., University of Wisconsin.**

This seems as if it would be a good summary of the January article on purge systems.—**J.M.M. SLO.**

CO_2 Condensing

QUESTION: Some time ago at a meeting in Louisiana Chapter No. 2, NAPRE, I had an argument with other members about CO_2. I maintain that if the inlet condenser water is 88 F there is no refrigeration.

In the Central American banana run, we used to load bananas in Puerto Cortez, Honduras, and then go over to Puerto Barrios, Guatemala. We arrived about 6 or 7 a.m., stayed there all day until about 8 p.m. to pick up passengers. At times the seawater for condensing goes as high as 94 F. Hold temperatures would go up and the temperature reduction periods extended to 14 hours.

When we would get into our home Port, the Research Dept. would come on the ship to find out why it took so long to reduce the temperature. Well they told us to stay out of the Bay, out by Cape Three Point where the water was 84 to 85 F until about 5 p.m., then come in to get the passengers.

One member I had the argument with was also a refrigerating engineer with United Fruit Co. I maintain his thermometer was out if he did any refrigeration with water at 92 F.—J.J.J., New Orleans.

ANSWER: You are quite right. There will be very little refrigeration if the inlet condenser water for a CO_2 refrigeration system is 87 to 88F. The critical temperature of CO_2 is 87.8F. That is, the highest possible condensing temperature is 87.8F. At higher temperatures the CO_2 will remain in the gaseous phase. The system might however produce a small amount of refrigeration. A portion of the heat will be removed from the gas at the condenser. gas will travel through the liquid line to the expansion valve; at the expansion valve the pressure of gas will be lowered, its volume will be increased and it's temperature lowered. If, due to the expansion, the temperature tends to be lowered below the critical temperature a small amount of liquid may be formed which will be useful for refrigeration. The amount of available refrigeration will be very small.

—N.S., San Luis Obispo.

NEW INQUIRIES of the QUESTION BOX

Holding Humidity Down With Indirect Refrigeration

QUESTION: On carload of ice which G. S. A. in his question on "Material Heats" in the September issue, wasted, could have been used very readily by this writer not too long ago. Contrary to usual practice, we were required to store a product at less than 50 rh, at a temperature of 36 to 38 F. Like G. S. A., I had some obsolete buildings only I was more fortunate in the fact that they were cooler storage rooms. I also had some old brine pipe coils but no more refrigerating plant. I didn't overcome my humidity problem, the merchandise in cans rusted, and we took a loss.

I have often thought of what I would do again in such an event, using a portable pump and a water ice refrigerant. Would someone care to check me by outlining steps to be taken, to accomplish the rh and temperature requirements if the room size is given, number of lineal feet and size of pipe, and the horsepower or gpm of the pump? The product was precooled when it was delivered and we were to hold it at these conditions in the field.
—J. A. H., Los Angeles.

Data Sought On Ammonia Safety

QUESTION: Where can literature be found on ammonia systems exploding, etc., and what the probable causes were? Also, if you have anything on the safety features that should be installed in a refrigerated warehouse and its system, where ammonia is used as the refrigerant?—A. G., Okinawa.

Designating Refrigerants By Chemical Compound Expressions

QUESTION: Our refrigerating system uses Refrigerant 113. In the compressor manual it is described as trichlorotrifluorethane (CCl_2F-$CClF_2$). Guy King's Table 9 in his paper "New Refrigerants", 1957 NAPRE Operating Data Book, shows the same gas to have a chemical formula of $C_2Cl_3F_3$. I presume either way to write it is correct but I would like to know why one author expresses the formula one way, and another author a longer more complicated expression.—R.L.F., Chicago.

Recurring Compressor Valve Troubles

QUESTION: During the past season we had more valve troubles than in any previous year. We are using the compressor manufacturer's own valves in both high-stage compressors and boosters.

The boosters were equipped with ring plate valves when new. Approximately five years ago we removed the poppet type suction valve from the high-stage compressors and installed a new valve by the machine manufacturer, which is a ring plate assembly. The discharge valves were originally the ring plate type.

At first we had trouble with the center rivet breaking, but now the manufacturer has overcome that problem. According to them, it had something to do with improper temper of the rivets. Now our trouble seems to be with sudden changes in gas temperature, resulting in broken plates.—C.S. and R.V.P., Pa.

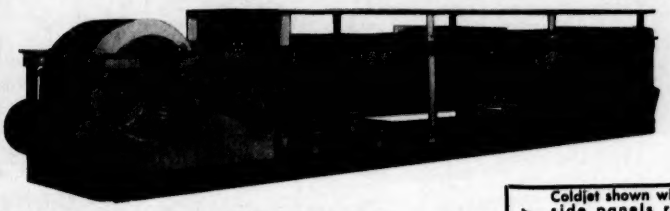
Regional Conference For West Coast NAPRE Units

▶▶OLYMPIA Chapter will be host to the Pacific Northwest Regional Conference, NAPRE, in a one-day meeting on Saturday, April 25. The following week-end, Los Angeles Chapter will host a California Regional Conference at the Mayfair Hotel for two days, May 1 and 2.

Three speakers are featured at the Olympia meeting which will be held at the Olympia Brewing Co. Modern refrigeration trends, automatic controls and refrigeration lubricant are the three major topics. Speakers are respectively Frank Knowles, Chet Bell and W. M. Fiander.

Refrigerated processing, construction trends, and servicing of automatic equipment are the three features for the California meeting. Processing poultry will be a leading discussion. Several new refrigerated structures in the Southern California-Arizona area will be examined in a panel affair. Maintenance and service programs for refrigeration and air conditioning equipment with particular emphasis on the so-called automatic systems will get attention.

COLDJET *Low Air Velocity* SPACE COOLERS



Coldjet shown with side panels removed. Cutaway shows 1" sealed-in cork insulation.

- Ceiling-suspended, saves space. (Fits between meat rails!)
- Gentle, quiet air movement eliminates drafts, adds to worker comfort.
- Cuts shrinkage of meat and other food products to a minimum.
- New design cuts installation and maintenance costs.

Imeco Incorporated
Write for Bulletin 958
Phone: JUniper 8-7117
3033 W. Belmont Ave., Chicago 18, Ill.

King Engineering Report

How to design and locate Sharp Freeze Systems for THE YEARS AHEAD...

At the King Co. system engineering is a science because fifty years of experience has demonstrated that no two plants are exactly alike. King engineers design and locate each unit where it will:

1. not interfere with plant expansion
2. minimize infiltration
3. use least valuable floor space
4. not conflict with other plant operations
5. require lowest installation cost
6. maintain maximum product storage space
7. be readily accessible for maintenance without interruption of cold room operation.
8. provide most efficient combination of above features

Other important considerations are uniform air distribution, and air turbulence without blast effects on the box men.

King engineers are always ready to advise operators of freezer or storage plants on the best procedure for any particular problem. This service is provided at no extra cost to users of King Sharp Freeze Systems.

50 years of experience is at your service

King COMPANY OF OWATONNA
407 Cedar St. OWATONNA, MINNESOTA

Packer's Ice Making Unit Crashes Thru Seven Floors

▶▶ FIVE MEN were killed, 15 injured and more possibly missing in the crash of an ice maker through seven floors at Wilson & Co., Oklahoma City, Tuesday, March 24. Located atop the building the 30-ft square base "dropped like a rock", according to UNITED PRESS INTERNATIONAL. Both UPI and ASSOCIATED PRESS reported survivors relating an explosion of unknown origin as apparently weakening the ice making base supports, permitting the entire plant to crash successively through each floor of the building. Coffee time and the successive crashes probably helped reduce the total injured and deaths. Among the utility service lines which ruptured were the refrigerant lines, permitting ammonia fumes to permeate the area.

Pre-Season Conventions Among The Ice Industry

▶▶ PREPARING for the ice season ahead, state and regional ice associations held their annual meetings and conventions from Oklahoma to Georgia, and from the Great Lakes to the Delta. Use of the new industry film "All The Difference In The World", received top billing at all the meetings. The film was prepared by the National Ice Association for distribution to its members for the purpose of aiding in ice sales promotion.

Southern Exchange

The Southern Ice Exchange and the Georgia Ice Manufacturers Association held a joint meeting at the Henry Grady Hotel, Atlanta, Ga., March 24 and 25. Marketing, advertising and production were the highlights. The featured speaker was B. F. Thompson, president of the Florida Ice Association who spoke on Safety In The Ice Industry.

Tar-Heel Meeting

Ten days earlier, on March 15, 16 and 17, the North Carolina Ice Association observed its Golden Anniversary at the annual meeting held in the Washington Duke Hotel, Durham. Three headline speaker topics covered: the ice business to be found among tourists, the cost of ice and maintenance machines, and other sources of revenue for ice plants. The new ice industry film was shown at this meeting also.

Tri-State Convention

Fourth Annual Indiana-Ohio-Michigan Ice Convention held in Cincinnati at the Netherland-Hilton Hotel, February 22-24 is reported as the most successful meeting to date. The attendance exceeded the 1958 convention. Featured speaker was the late Richard C. Muckerman, president of the National Ice Association who gave a talk, not only on national work, but included specific data on hydro-cooling applications on the West Coast. The hydro-cooling project featured the ice services supplied for perishables at both the grower and the canner. Another outstanding hit was the visit to the City Products plant to observe the processing operations which featured a crushing technique that improved ice quality, reduced snow and increased productivity.

Officers elected for each of the state associations were as follows: Ohio: President, E. J. Dager, Bucyrus Ice Company; Vice-president, J. W. Twomey, City Products Corp.; Secretary-treasurer, Miss Elizabeth Shannon, Steubenville.

Indiana: President, E. E. Boyce, Irvington Ice & Coal Co.; Vice-president, Clarence Weaver, National Ice & Coal Co., both of Indianapolis; Treasurer, Robert Miller, Vigo Ice & Cold Storage Co., Terre Haute, and Executive Secretary, Robert Walton. The Indiana Directors are Leland Lusk, Shelbyville, H. L. Dithmer, Indianapolis, Harold Dailey, New Castle, Max Welch, Rockville and Fred Hardwick, South Bend.

Michigan: President, Eugene T. Scott, City Products Corp., Grand Rapids; Vice-president, John McKellar, Detroit City Ice & Fuel Co., Secretary-treasurer, Ed. W. Jackson, Kalamazoo.

Delta Met At Biloxi

Meeting at the same time as the Tri-State Convention, the Delta States Association gathered at the Buena Vista Hotel, Biloxi, Mississippi. A manufacturer's forum was a special feature which proved to be a highlight. The panel was moderated by James D. Harris. Serving on the panel with him was J. J. Ballard, Tom Clark, Joseph Joachim, A. A. Geiger, J. S. McLemore, C. R. Roach and Gil Sheeley. As with the other three conventions mentioned, the Association's new film was screened for the convention. Delta officers elected were President, Sam Cook, Vice-president, A. P. Hernandez, Treasurer, G. Thomas Frazer and Secretary, Mrs. Edna Vaughan.

Missouri Valley Meeting

Three more ice associations met at a joint meeting, their Third Annual affair, at Oklahoma City on January 18 to 20. They were the Oklahoma, Kansas and Missouri Valley Ice Associations. In addition to the new film, truck icing was featured. Officers elected by the three associations were Oklahoma: President, W. R. Addison, 1st Vice-president, Frank C. Robson, 2nd Vice-president, Fred A. Simank; Treasurer, Clyde Simmon, and Secretary-counsel, Harry Hudson.

Kansas: President, Thomas G. Carroll, Vice-president, Lee Offutt, Secretary-treasurer, Matt Scherer.

Missouri Valley: President, Harold Margolin, Vice-president, Willard L. Butts, and Secretary-treasurer, Richard C. Muckerman, now deceased.

Two More Firms Acquired By Royal Palm Ice, Miami

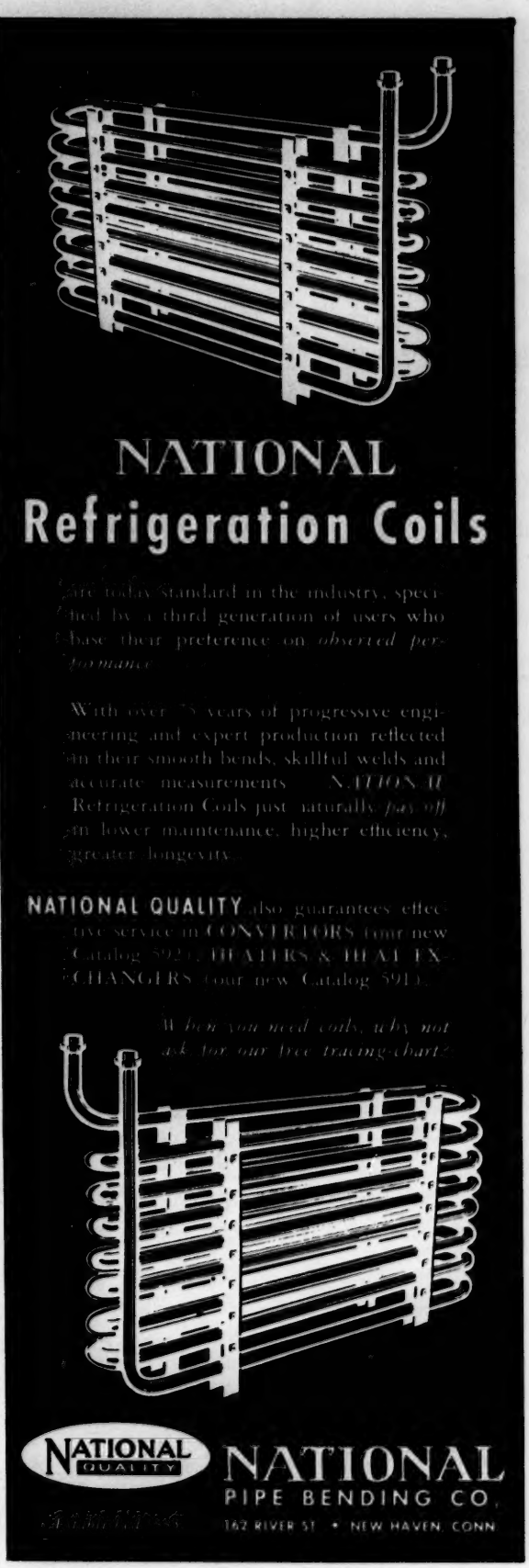
▶▶HOME ICE CO. and Citizens Ice Co., both in the Northwest area of Greater Miami, were acquired in February by the Royal Palm Ice Co. A daily news report quoted the vice-president and general manager of Royal as saying the property was acquired for a substantial sum. Royal Palm, a subsidiary of Southeastern Public Service Co., has been doing business in Miami since 1926.

Iceman Won't Come

▶▶SHERIFF of New York, placed in the position recently of appealing to the New York budget officials for an extra $1500.00 to replace the ancient icebox of the city jail, related that they could no longer find anyone to deliver ice; according to a recent UNITED PRESS INTERNATIONAL anecdote.

Quicksand Frozen For Tunneling

▶▶FIVE WEEKS of around-the-clock refrigeration were required to solidify approximately 140x20-sq.ft of 10-ft thick quicksand, to replace a center supporting wall of Montreal's Mount Royal Tunnel, with a concrete arch. It was learned that the 10-ft layer of quicksand lay above the roof, about six feet below the frost line.



"WHAT'S NEW" (Continued)

Baton Rouge Chapter Added By NAPRE

▶▶ANOTHER Louisiana Chapter was chartered by the National Association of Practical Refrigerating Engineers on February 28. Frank L. Chase, junior past national president presented the charter to Lester E. Mitchell, president of the new group. Chase was assisted in the membership initiation, charter presentation and installation of the first officers of the new chapter, by a number of engineers from Louisiana Chapter No. 2 at New Orleans.

Officers of the Baton Rouge Chapter are: President, Lester E. Mitchell, chief engineer, Bellmont Hotel; 1st Vice-President, Ross N. Stout, refrigeration engineer, Louisiana State University; and Secretary-Treasurer Vincent F. Keogh, chief engineer, Louisiana National Bank, all of Baton Rouge. Roland A. Neve, Trane Company sales representative serves as the chapter educational chairman.

Responsible for the introduction of NAPRE into the Baton Rouge area were Al Ballanco, Reilley-Benton Co., John Funel, Equitable Equipment Co., and Norman Levenson, Accurate Industries, Inc., all of New Orleans. Attending the chartering ceremonies from New Orleans were Mr. C. Brindel, and Messrs and Mesdames Frank Chase, Leo Vivien, Louis Howat, Max Sofer, J. Chaisson, Norman Levenson, J. Funel, D. Fisher, Al Lusch, A. Bellanco, W. Merwin, M. Olivier, T. Holloway, J. Wessell, F. Toups, Charles Smith, W. Whiteside, Wm. Sikkink, T. Munget and G. Post.

New Oregon Chapter Charter To Portland

▶▶OFFICIALLY CHARTERED March 14 in a ceremony at Portland, Oregon, was the revived Oregon Chapter No. 1. Although over a year ago the NAPRE Board of Directors did award the charter, the group did not hasten to make it official, desiring to enroll as many "charter" members as possible. Regional Vice-President Falconer Anderson initiated the new members, presented the charter and installed the chapter's first permanent officers.

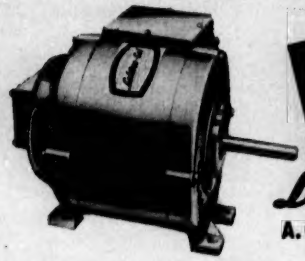
Leaders of the new Oregon chapter are President Curtis McKeeman, chief engineer, Terminal Ice & Cold Storage, Portland; Vice-president Phill A. Williams, chief engineer, Capital Ice & Cold Storage, Turner; Secretary-treasurer Phil Gilmore, assistant chief engineer, Northwestern Ice & Cold Storage Co. Hayden Smithson, chief engineer, Pacific Fruit Co. was appointed educational chairman; L. D. Jones, Lucky Lager Brewing Co., membership chairman; Carey Price, Northwestern Ice Company, is the chapter instructor.

Lynn Mills, chief engineer Northwestern Ice & Cold Storage Co. and former national director of NAPRE, and Frank Knowles, a founder of the Seattle chapter, NAPRE, shared the speaking assignment with McKeeman and Chet Bell, program chairman. Following the charter ceremonies, the new chapter transported all the attendants and their wives to the Riverside Country Club for an evening of dancing and entertainment.

Meat Air Lifted

▶▶EARLY in February an inaugural shipment of chilled beef weighing three-fourths of a ton was air lifted from Salisbury, Southern Rhodesia to London, England. It was assigned to Smithfield Market, according to the London FINANCIAL TIMES. Condition of the beef was reported as excellent, and agents for the Cold Storage Commission of Southern Rhodesia stated that the shipment was one of the longest air lifts of chilled beef.

OVER-THE-ROAD REFRIGERATION!
Now! Convert your fleet at low cost!



NEW!
DOLE
Lektro-Cel
A. C. GENERATOR KIT

- Your present plug-in refrigeration can now be used for Over-The-Road operation.
- Power also available for heating, auxiliary lighting, pumps, etc.
- Kit furnished complete with all necessary parts for ease of installation.
- Low in cost, easily maintained.

DOLE REFRIGERATING COMPANY
5938 NORTH PULASKI ROAD, CHICAGO 46, ILLINOIS
103 PARK AVENUE, NEW YORK 17, N. Y.
Dole Refrigerating Products Limited, Oakville, Ontario, Canada

Write for Engineering Catalog HGE

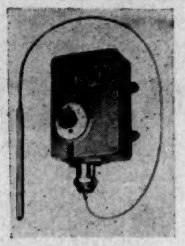
DOLE THE Cel LINE
Lektro-Cel

COMPLETE REFRIGERATION SYSTEMS ALSO AVAILABLE

WORKS WHERE OTHERS FAIL

R S CONTROLS
FREON-12
FREON-22
COMBINATION WATER REGULATOR
Ask Your Wholesaler

REFRIGERATING SPECIALTIES COMPANY
3004 W LEXINGTON ST • CHICAGO 12 ILLINOIS



Transport Temp Control

CARGOES LOST or seriously damaged in transit because of temperature control instrument failure, will be reaching an elimination point with continued improvements in transport controls. Generally built with stationary applications in mind, controls have not always stood up under the shocks and bumps of railroad and truck transport. A New York firm has recently introduced a multi-stage control built with a minimum of moving parts which has little to get out of order and does not depend upon hair trigger springs, electronic devices or other functional principle which is easily disturbed by rugged handling.

These new controls are reported to operate through simple and positive action with expansion of mercury. Further, they are designed for multi-stage cooling or heating, being equipped with 2 to 5 switches, each of which may be set to operate independently. Any combination up to four functions can be handled by the controller in sequence.

As an example, the control may be used to refrigerate a space where it is desirable to cut in three separate stages of refrigeration successively on rise of temperature in two degree increments and also apply one stage of heating should the temperature drop below the first stage of refrigeration. Provision is also made to prevent operation of heating stages. The controls, however, should be located as far as possible from any heat source and the medium being sensed should circulate freely around the mercury bulb of the instrument.

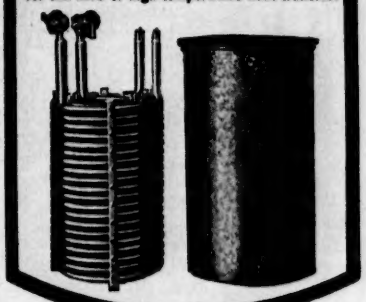
Electrical Equipment

SUITABLE for application to continuous freezer operations, production lines, conveyors, etc., is a new adjustable speed drive by a Milwaukee manufacturer. Available at 3/4 to 7-1/2 hp, all brushes, commutators and slip-rings have been eliminated in the a.c. motor drive. Motor and eddy current clutch are built into a common housing which is nearly 1/4 less in length than previous construction. Motor and brackets are now interchangeable with standard flanges and can be flanged mounted.

The motor drives a clutch drum at constant speed while speed on the output member is adjusted by varying excitation to the clutch coil. Direct current is supplied by a small controller, and finger tip command of drive operations is centered in a separate operator's station. An automatic feed-back circuit continually monitors the drive shaft and automatically corrects speed.

ECONOMIZE!
STANDARDIZE!
on "Rempe"
PIPE BENDS AND COILS
FOR REFRIGERATION

Rempe Shell and Coil Assembly
for sub-zero or high temperature heat transfer.



In Rempe Coils you get Top Engineering and Quality Construction — the best in Refrigeration Equipment for long-life and low maintenance.
For Ammonia or Freon. All materials — Stainless Steel, Copper, Steel.

REMPE COMPANY
348 N. Sacramento Blvd., Chicago 12, Ill.

K. G. BROWN
Presents
the NEW Multi-Screw
VENDOR for 1959

Profit-Making Pacesetter
in AUTOMATIC Ice Vending

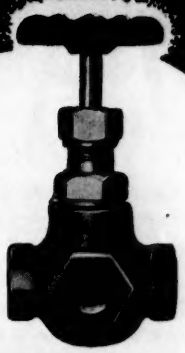
More Sales + More Storage + Less Cost + Less Servicing
- An increased capacity of 40% over previous models.
- Multi Single Line Vending of any size package or block, regardless of the type of tie.
- These new vendors are now made in lengths up to 20' which will vend 268-10# bags plus 132-25# blocks out of the same delivery door, (400 Sales).
- Up to 5 various sizes of blocks or bags can be vended from this one vendor.
- Radical invention, trouble free, more storage space by design, lower operational cost.

NEW LOW COST 6' x 8' station vends 110-10# packages, or the "Junior", 3' x 7' station vends 90-10# packages using the new multi screw vendor.
ILLUSTRATED 9' x 16' Station vends 168-10# bags and 86-25# block.

BROWN MFG. CO., INC., MATTITUCK, N. Y.

Efficient Designs For Long Life
And Low Maintenance

SHANK AMMONIA VALVES



Shank Valves have earned a reputation for high quality, long life and dependable products.
Built of highest grade materials with close tolerances—will stand most rigid inspections.
Largest line of Ammonia All-Steel Bar Stock Valves in the industry. Completely Cadmium plated.

STOCKED BY LEADING JOBBERS

- Shut Off Valves
- Line Valves
- Three Way Valves
- Gauge Sets
- Relief Valves
- Expansion Valves
- Steel Purge Valves

Write for Catalog

CYRUS SHANK COMPANY
4632 West 12th Place Chicago 50, Illinois

PIPE BENDS

Coils, Headers and Fabrications . . .

the tougher the job, the better our expert metalworkers like it. With their modern equipment, they produce the finest work to your precise specifications. In any metal, even stainless steel, or up to 6-inch extra heavy. For fast, quality bends, backed up by nearly 40 years specialization, call on us!

May we quote on your next job?

CHICAGO NIPPLE

MANUFACTURING CO.
1997 Clybourn
Chicago 14

Little Giant Model 90M

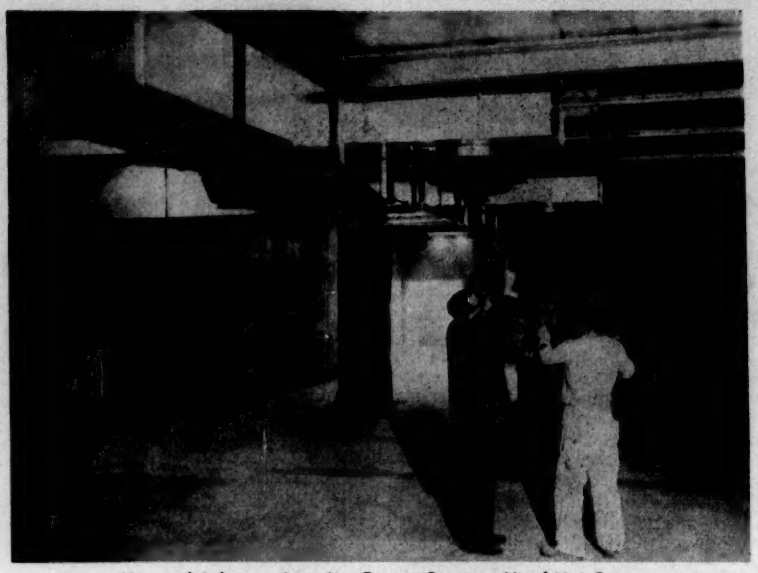
11 MODELS IN THIS LINE OF ICE BREAKERS FOR:

RESTAURANTS • HOTELS • AIR LINES
RAILROADS • LABORATORIES • TAVERNS
ICE PRODUCERS • PACKING HOUSES

The Little Giant Line has a long record of service to many types of users. These breakers are designed to break ice in rice to chestnut to 3" size and pea to chestnut to 4½" size. Hand and power operated. Write for details and prices.

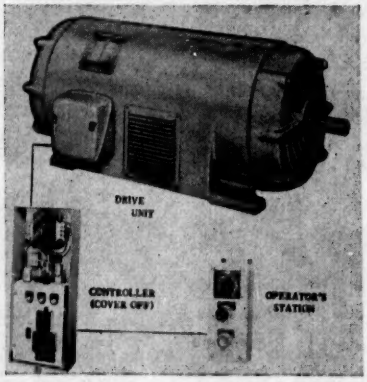
LITTLE GIANT

DEPENDABLE ICE BREAKERS BY MICRON, INC., BETTENDORF, IOWA



Howard Johnson, Inc., Ice Cream Storage Used Uni-Crest.

▶ANOTHER MILWAUKEE manufacturer has introduced a new size clapper-type 3-pole magnetic contactor for motor controls rated up to 1350 amps at 600-volts. Compact, the capacitor which is mounted on ebony asbestos panel, is available in either two or three poles, alternately mounted with magnetic as-



semblies. Contactor is d.c. operated from 110 volt a.c. rectified source. It is particularly adaptable to control devices, starting motors up to 900-hp at 440-volts and 450-hp at 220-volts. It is being used by refrigeration and air conditioning manufacturers to control compressors.

Insulations

▶WIDESPREAD ACCEPTANCE of polystyrene and polyurethane foamed insulation has become an established fact. Not only at the Frozen Food Packers show was this evident in some of the storage and freezer equipment offered, but other food product and storage meetings, such as the various Meat Packer groups and the Refrigerated Warehousemen meetings scheduled in April will feature these insulation products and their application. The Dairy Show last December kicked off considerable interest in these methods.

▶UNITED CORK COMPANIES, Kearney, N. J., announced recently that their new versatile insulation product, "Uni-Crest" is now available with a self-extinguishment feature. Meeting the customary requirements with regard to odor, toxicity, stability, imperviousness to insects, vermin and fungi, as well as moisture resistant, this newest value greatly increased the product's potential in refrigeration, building construction and transportation industries. Light weight, the material is easily handled and installed, being cut with any common cutting tool.

Manufactured from tiny polystyrene granules or beads which are fused into a snow-white homogeneous mass, the product's structure is composed of millions of minute, individually closed cellules, giving it unusually low K-factor. "Uni-Crest" is available as basic bead or in molded sheet, slab or block form. Board sizes are available up to a maximum of 12'x4'x8".

The material is used in the new Howard Johnson, Inc., ice cream hardening room at their Englewood, New Jersey plant constructed in 1958, and, to which a second addition is now being added. "Uni-Crest" was applied in 10 in. thicknesses against the walls, over the ceiling and under the floor.

▶EXPANDED polystyrene insulation was also introduced in 1958 by the Johns-Manville Corp. for cold room insulation. Known as J-foam, a cubic foot of the material weighs only one pound and has been used for a number of dairy installations, as well as frozen food plants.

J-foam is easily cut and provides excellent surfaces for adhesive fastening to ceilings. When new concrete ceilings are to be insulated, this new product may be placed on top of wood forms and coated with asphalt emulsion. Where two layers are used they are bonded with adhesive. Concrete wearing floors may be poured directly over J-foam.

"WHAT'S NEW"

▶NEW LOW COST POLYETHER was marketed by a powder company in Delaware earlier in the year replacing more costly materials used in the manufacture of rigid polyurethane foam. These rigid foam plastic materials are becoming increasingly important as a strong filler in new sandwich type construction featured for commercial refrigerators, freezers, railroad cars and trucks.

▶URETHANE FOAM, expanded with "Freon" for a low temperature insulation fill was announced by a New Jersey firm. This radically new Lockfoam has developed characteristics of only one-half the thermal conductivity of some of the existing foams. K-factor of typical foams is about .25-.28. Using "Freon" in a typical polyester resin reduced the K-factor approximately .15-.18, producing K-values of about .1. Aging does not apparently affect the K-factor.

▶CONSUMPTION of the urethanes was about 17 million lbs in 1957 and 50 million lbs in 1958, of which approximately 5 million lbs went into rigid foams. Rigid foams are still in the vigorous growth stage.

Following announcement of the Foamed-In-Place application in a Los Angeles dairy, in INDUSTRIAL REFRIGERATION in December '58, page 7, this publication received a number of inquiries as to where equipment could be obtained or contractors contacted. Since that time, a national manufacturer of adhesives, coatings, sealers, has announced the development of a formulator and spray gun for low cost application of insulating foams. The equipment is easily mounted on an ordinary warehouse platform truck for mobility. There are approximately 20 foamed-in-place applicators in the U. S.

Allied Field Tests Trucks

▶UNDER WAY PRESENTLY is a series of field tests on refrigerated truck trailers by Allied Chemical's National Aniline Div. Purpose is to evaluate insulated sandwich panels constructed of rigid urethane foam. These tests constitute the initial stage of a program aimed at determining the value and practicality of rigid urethane insulated panels for trailers, railroad cars and other refrigerated equipment. Thus far demonstration tests indicate that modular panels of this insulation are excellent for truck trailers. They withstand temperatures of 250 F without deterioration and indicate a heat gain of only 2.6 Btu/hr/°F/foot length of trailer. Trailers were 38 foot.

Five trailers were tested, one being insulated with urethane foam and the others with various types of fibrous glass materials. The average heat gain for the best performance of the other four trailers was 3.3 Btu/hr/°F/foot length of trailer. Of significance was the fact that the roof of the urethane insulated trailer was four inch thickness whereas the other trailers had a total thickness of six-inch insulation. The rigid foam panels required only one-fourth of the time involved in insulating with the other type of material.

PVC Pipe Gaining In Refrigeration Uses

▶COST SAVINGS and other advantages are resulting in a steady increase in the use of plastic piping, it was reported to the 39th Annual Meeting of the American Institute of Chemical Engineers in Atlantic City on March 17.

Unplasticized polyvinyl chloride (PVC) type I is proving the most versatile plastic piping available for general use in the temperature range of zero to 150 F, according to JOURNAL OF COMMERCE.

Broad range chemical resistance, availability of fittings in a wide size range, ease of installation and reliability have contributed to the gains made.

One firm reported that a process application involving some 3,000-ft of pipe in sizes 1/2-in. to 6-in. with several hundred fittings and valves, saved approximately $40,000 in the use of plastic instead of aluminum, stainless steel and harder nickel alloys.

VAN RENSSELAER H. GREENE ASSOCIATES
CONSULTING ENGINEERS
VAN R. H. GREENE — NILS R. BERNZ

REFRIGERATION SPECIALISTS
COLD STORAGE—FOOD PROCESSING—INDUSTRIAL

ENGINEERING SURVEYS, APPRAISALS, COST STUDIES,
COMPLETE ENGINEERING DESIGNS FOR TEMPERATURE AND HUMIDITY CONTROL.

11 PARK PLACE **NEW YORK 7, N.Y.**

Classified Advertising

USED EQUIPMENT—wanted & for sale

FOR SALE—4x4 York compressor, with motor, all on one base. One 30" freezer door. Write E. Niebling, 1546 St. Clair Ave., Mount Healthy, Cincinnati 31, Ohio.

REFRIGERATION EQUIPMENT FOR SALE
Advise Us Your Needs
Use QUICKSEAL—stops brine tank leaks.
Use CLERTEMPICE—clears and tempers ice.
Born Company 80 East Jackson Boulevard.
Chicago 4, Illinois. WAbash 2-3299.

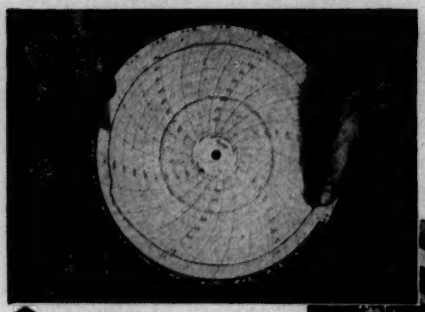
FOR SALE—AMMONIA EQUIPMENT
3—15 ton complete Frick ice making plants, new, in crates. No air system; sold as used.
1—65 ton Niagara Aero evaporative condenser.
1—80 ton Niagara Aero evaporative condenser.
1—Carrier Carene #1 85 ton capacity complete
2—10"x10" 4-cyl. York duplex DC to 225 h.p. motor.
1—9"x9" 4 cyl. York duplex DC to 150 h.p. motor.
2—9"x9" 2 cyl. York DC to 75 h.p. motors.
2—10"x10" 2 cyl. York DC to 125 h.p. motors.
1—9"x9" 2 cyl. Frick compressor.
1—7¾"x5" 2 cyl. Frick booster.
1—3"x3", 1—4"x4", 2—5"x5" condensing units.
3"x3", 4"x4", 5"x5", 6"x6" compressors.
11x22x51"—300# ice cans; also 11x22x47".
Ice plants, 25 to 100 tons, York & Frick.
ENTERPRISE EQUIPMENT CORPORATION
328 Bryant Ave. Bronx 59, N.Y.
Cable "ENTREMA" Phone DAyton 8-2121

FOR SALE—9½x9½ Vilter compressor, forced feed lubrication, also 4 point lubricator; heads just removed, all valves inspected, crankcase cleaned; machine in excellent condition. 10 groove flywheel with belts, 60 h.p. motor with pulley. This compressor could use 100 h.p. motor and run 360 r.p.m. Othello Ice & Cold Storage Co., P.O. Box 1316, Othello, Wash.

FOR SALE
9x9 York "Duplex" 200 h.p. compressors 360 r.p.m.
10x10 York 125 h.p. motor.
9x9 York w/V-belt drive 75 h.p.
6½x6½ York & 5x5 York self-contained unit.
350 h.p. Carrier water chilling unit.
(2) 100 h.p. & (1) 75 h.p. brine chillers.
(2) 1½ h.p. Carrier cold air diffusers.
34"x16'-10 pass shell & tube condenser.
Complete ice making plants 50 to 100 tons.
JOHN F. CARSON
A & Venango Sts. Philadelphia 34, Pa.
GArfield 6-2221

Plants For Sale

FOR SALE—Modern cold storage plant, in Columbia County. Railroad siding, 3 car private. Main building of concrete blocks, steel frame, 125x85, 5 stories high, annex 48x50, 3 stories high. 550,000 cubic piling space, 5 room office space. Graves elevator, engine room. Price $225,000 asking, incl. fixed assets, equipment, good will. Write E. I. Hatfield, 46 Cannon St., Poughkeepsie, N.Y.



This record chart taken from the beef cooler indicates how closely Vilter refrigeration equipment and Zer-O-Disc fin coils held the required temperature of 34 degrees and relative humidity of 85% over a 24-hour period. This day-in-day-out reliability is one reason for the wide acceptance of Vilter units in the packing industry.

360,000 pounds of beef are held in this cooler at the Serv-All Foods plant, Covington, Kentucky. Mr. Al Fedders is checking temperature and relative humidity maintained at 34 degrees and 85% relative humidity by Vilter Zer-O-Disc fin coils.

"VILTER Zer-O-Disc FIN COILS ARE THE ANSWER TO CORRECT TEMPERATURE AND HUMIDITY CONTROL,"

says Al Fedders, Maintenance Engineer, Serv-All Foods, Inc.

Holding 360,000 pounds of beef in a single cooler at 34 degrees and at 85° relative humidity is a "man-sized" job. Vilter Zer-O-Disc finned cooling coils and refrigeration equipment perform this service dependably day-in-day-out.

620 feet of Zer-O-Disc fin coils are installed in this large cooler. Correct temperature and humidity are maintained because these coils produce slow, even, positive air circulation naturally by convection. The extended fin surface cools the slowly moving air mass more quickly . . . floods the room with cold . . . holds temperature at proper level for better storage. There are no "dead spots" in the room. Product discoloration or shrinkage are minimized.

Other Vilter refrigeration equipment includes two 8-cylinder VMC ammonia booster compressors, two 8½ x 8½ vertical second stage compressors, two liquid recirculating accumulators and evaporators. Vilter equipment provides refrigeration for the large beef cooler, two main storage freezers (– 5° F.), blast freezer (– 35° F.) and four smaller storage coolers.

Call in your nearest Vilter representative and let him show you how you can improve your storage cooling for meats and sausages.

Sold and Installed by Vilter Distributor, C. P. Wood & Co., Cincinnati, Ohio

Write for helpful bulletins to
The Vilter Manufacturing Company
Dept. H-806
2217 S. First Street
Milwaukee 7, Wis.

Vilter®
REFRIGERATION and AIR CONDITIONING

Bulletin 518 Vilter Zer-O-Disc Finned Cooling Units

Bulletin 817 Vilter VMC Ammonia Compressor

THE VILTER MANUFACTURING COMPANY, Milwaukee 7, Wisconsin
Air Units • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Water & Brine Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pipe Coils • Valves & Fittings • Pakice & Polarflake Ice Machines

ADVERTISERS

Allied Chemical Corp., General Chemical Div. . . Inside Front Cover
Armour & Co. 2
Armstrong Cork Co. 5

Ball Valve Co. 25
Brown Mfg. Co., Inc., K. G. 37
Butcher Boy Refrigerator Door Co. 1

Chicago Nipple Mfg. Co. 38
Classified Advertising 39
Creamery Package Mfg. Co., The 23

Dole Refrigerating Co. 36

Greene Associates, Van R. H. 39

Howe Ice Machine Co. 31

IMECO, Inc. 33

Jamison Cold Storage Door Co. . . Back Cover
Johns-Manville Corp. . . . . 20 and 21

King Co. of Owatonna, The 34
King-Zeero Co. 29
Kohlenberger Engineering Corp. 30

Micron, Inc. 38

National Pipe Bending Co. 35

Phillips & Co., H. A. 27

Recold Corp. . . . . Inside Back Cover
Rempe Co. 37
Refrigerating Specialties Co. 36

Safeway Heat Elements Inc. 6
Shank Co., Cyrus 37

Vilter Mfg. Co., The 40

Wanted and For Sale Advertising 39

Engineering the temperature...

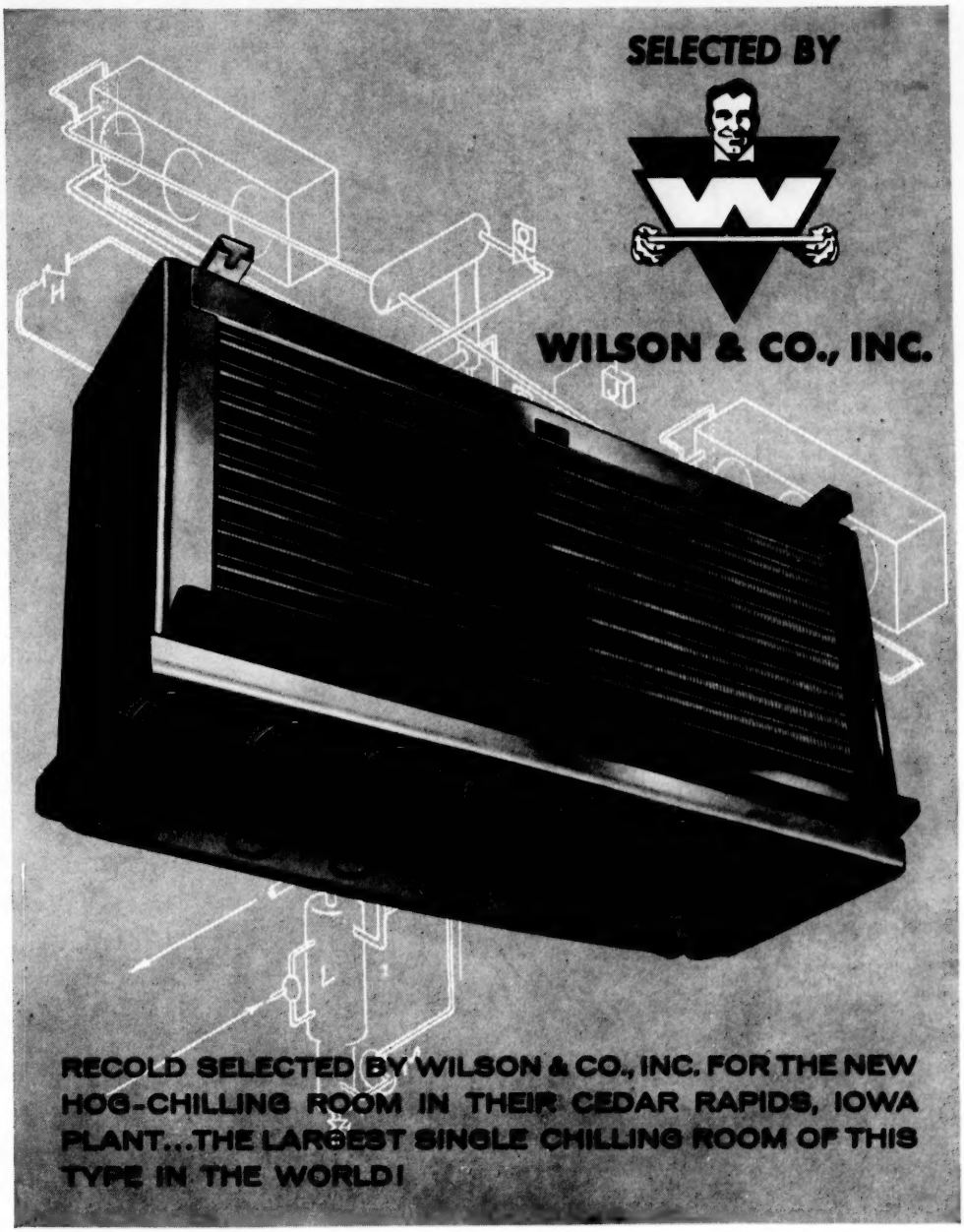
WITH VAPOMATIC DEFROSTING FOR AMMONIA*

Recold ammonia coils will safely withstand full condensing pressures without the use of pressure-limiting devices. The reason? Only steel is utilized in the refrigeration and defrost circuits.

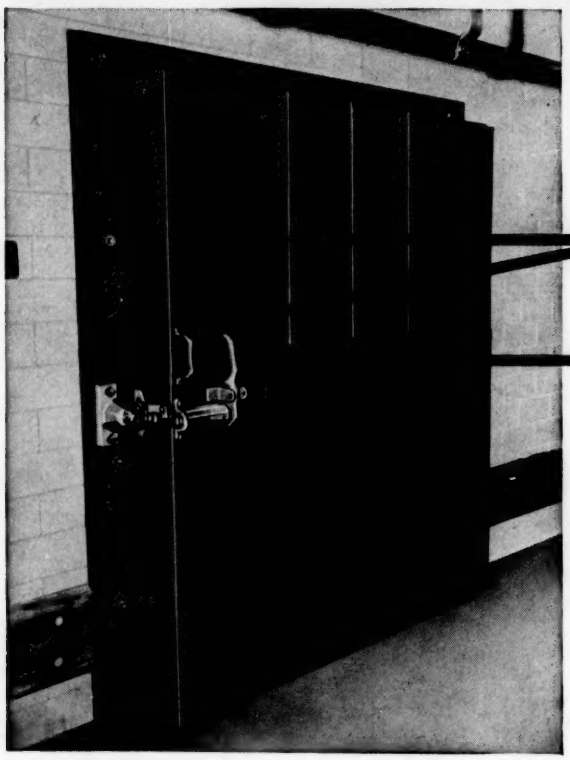
Complete piping and control diagrams for automatic and manual defrosting are now available. Write for: Vapomatic Defrosting for Ammonia

RECOLD **CORPORATION**
7250 East Slauson Avenue, Los Angeles 22, California

RECOLD


SELECTED BY
WILSON & CO., INC.
RECOLD SELECTED BY WILSON & CO., INC. FOR THE NEW HOG-CHILLING ROOM IN THEIR CEDAR RAPIDS, IOWA PLANT...THE LARGEST SINGLE CHILLING ROOM OF THIS TYPE IN THE WORLD!

Extra protection features for Jamison super freezer doors



batten doors and
vestibule save refrigeration

metal cladding on frame and back of door
for protection from vapor and moisture

exclusive Jamison Vap-r-tyt* construction for
protection against vapor penetration, has locked
and soldered seams and sealed bolt holes

metal kick plate 48" high on frame and inside and outside
of door for protection against bumping and abuse

Vap-r-tyt is a Jamison trademark

JAMISON

COLD STORAGE DOORS

HAGERSTOWN, MARYLAND, U. S. A.